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HYDROMEDUSAE FROM THE DISCOVERY COLLECTIONS

by

P. L. Kramp

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By

P. L. KRAMP

Zoological Museum, Copenhagen, Denmark

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HYDROMEDUSAE FROM THE DISCOVERY COLLECTIONS

By P. L. Kramp

Zoological Museum, Copenhagen, Denmark

(Plates I–VII, text-figs. 1–19)

INTRODUCTION

THE Discovery collections of Hydromedusae dealt with in the present paper comprise 85 species, namely, 25 Anthomedusae, 19 Leptomedusae, 4 Limnomedusae, 22 Trachymedusae, and 15 Narcomedusae. The following species, the type specimens of which are in the British Museum (Natural History), are described as new:

Euphysora gigantea sp.n.
Ectopleura sacculifera sp.n.
Rathkea africana sp.n.
Merga rubra sp.n.
Leuckartiara annexa sp.n.
Russellia mirabilis g.n., sp.n.
Amphogona apicata sp.n.

Many species are represented by numerous specimens, but these do not represent the total numbers caught in the nets, but only those picked out from the samples and sent to me for examination.

Under each species are given the most important references to the literature, a list of stations where the species was collected, its history (where necessary), some remarks on the morphology (except in the case of very well-known species) and the geographical distribution.

The lists of stations usually comprise all details of date, depth, etc., but in the case of 17 of the most common species these are given in tabular form in Table 1.

The specimens are preserved in formalin, and in comparison with the collections from most other great expeditions the state of preservation is generally very satisfactory, so that it has been possible to make valuable additions to our knowledge of the morphology of several species. Most species of Narcomedusae are, however, extremely fragile, and unfortunately within this group many specimens were indeterminable. However, the collection of Narcomedusae is extensive, and from the material in more or less fair condition and representing several species I have been able to make important progress towards a revision of the species belonging to the genera *Pegantha*, *Solmissus* and *Cunina*, by means of characters to which little attention was paid before. A reliable revision of these medusae, however, requires the study of living specimens.

Vanhöffen's incomplete descriptions are frequently a severe obstacle to our attempts to identify the species established by him. I have been fortunate enough to unravel his species of the genus *Arctapodema* (of the Trachymedusae), three of which are represented in the Discovery collection. Moreover, the extensive material of Halicreidae has convinced me of the correctness of my previous conception of the delimitation of the species of this family, four of which were established by Vanhöffen. Some critical remarks on the tendency by M. E. Thiel to unite several different species are also given.

A comparison of Haeckel's original specimens of *Bougainvillia platygaster* (which are in the Zoological Museum of Copenhagen) with several specimens in the Discovery collections has enabled me to state the position of this species which has been open to question, and its interesting method of asexual propagation is described here for the first time.

A new, most peculiar species is described as *Russellia mirabilis*; it does not merely represent a new genus, but a new family of Anthomedusae.

Four different species of commensal larvae of Narcomedusae of more or less doubtful affinity are also described.

Many species were found in localities far away from their previously known areas of distribution. The Discovery collection, therefore, is of great importance from the point of view of distribution. The systematic account of the species is followed by a zoogeographical discussion.

ABBREVIATIONS

WS: collected by R.R.S. 'William Scoresby'.
MS: collected from the Marine Station on South Georgia.
St. without addition: collected by R.R.S. 'Discovery' and R.R.S. 'Discovery II'.

SYMBOLS used for nets, etc.

B oblique haul.
H horizontal haul.
V vertical haul.
(–o) indicates that the net failed to close at the required depth and was fished to the surface.
Unless specially noted to the contrary, nets N 200 and N 450 were towed horizontally.
BNR Russell's bottom tow-net; a 100 cm. net on a frame attached to skids which raise it clear of the bottom.
BTS Small beam trawl; mesh at cod-end ½ in. (12·5 mm.).
DLH Large dredge; light pattern, 4 ft. in length (1·2 m.).
DRR Rectangular dredge bag bent on to a Russell frame with skids.
N4–T, N7–T } Nets with mesh of 4 mm. or 7 mm. attached to back of trawl.
N 50 50 cm. tow-net; mouth circular, 50 cm. in diameter; 200 meshes to the linear inch.
N 70 70 cm. tow-net; mouth circular, 70 cm. in diameter; mesh graded, at cod-end 74 to the linear inch.
N 100 1 m. tow-net; mouth circular, 1 m. in diameter; mesh graded, at cod-end 16 to the linear inch. From 1 July 1927 the cod-end made of stramin with 11–12 meshes to the linear inch.
N 200 2 m. tow-net; mouth circular, 2 m. in diameter; mesh graded, at cod-end 4 mm.
N 450 4½ m. tow-net; mouth circular, 4½ m. in diameter; mesh graded, at cod-end 7 mm.
NCS–D Tow-net of coarse silk, with 16 meshes to the linear inch, attached to dredge.
NCS–T Same attached to back of trawl.
NH Hand net.
NRL Large rectangular net; frame 2·45 × 0·7 m., with bag of ½ in. mesh (12·5 mm.).
NS Seine net; length 55 m.; mesh at cod-end 1½ in. (3·8 cm.).
OTC Commercial otter trawl; head rope 24·5 m.; mesh at cod-end 1½ in. (3·8 cm.).
RM Mussel rake.
TYF Young-fish trawl; mouth about 20 ft. in circumference (6 m.); bag of stramin with 11–12 meshes to linear inch. Fished until July 1926 with poles and otter-boards, thereafter attached to a circular tow-net frame 2 m. in diameter.

SYSTEMATIC ACCOUNT

ANTHOMEDUSAE

Family CORYNIDAE

Sarsia gracilis Browne 1902

1902 *Sarsia gracilis* Browne, p. 275.
1939 *Sarsia gracilis* Browne & Kramp, p. 271, pl. 14, figs. 1–2, pl. 15, fig. 1.

OCCURRENCE: St. 91. 8. ix. 26. ½ mile off Roman Rock, False Bay, South Africa. Net: NCS-NRL, 35 m. 1 specimen.

The specimen is 6 mm. high, 4·5 mm. in diameter. The manubrium has been artificially stretched to a considerable length, causing the gonad to be divided into two parts separated by an extremely thin thread consisting of the mesosarc layer alone. Apart from this thread-like portion, the manubrium is completely covered by the gonad from its base almost to its extreme end. The four marginal tentacles are characteristic of *Sarsia gracilis* and terminate in a large, oval knob. They are covered throughout the greater part of their length with groups of nematocysts, which towards the distal end of the tentacles are confluent, forming transverse bands or almost complete rings. Therefore I do not hesitate to refer the specimen to *S. gracilis*, in spite of the prolongation of the manubrium which undoubtedly is due to mutilation.

DISTRIBUTION. South Africa, Falkland Islands.

Family TUBULARIIDAE

? Corymorpha sp.

(Pl. I, fig. 1)

OCCURRENCE: St. 256. 23. vi. 27. 35° 14′ S, 06° 49′ E, off South-West Africa. Net: TYF 850–1100(–0) m. 1 specimen.

The specimen is 1·5 mm. high and wide, globular, the gelatinous substance very thick. The four radial canals and the ring-canal are fairly broad; a long apical canal reaches almost to the top of the umbrella. There are no marginal tentacles, not even rudimentary bulbs. The manubrium is carrot-shaped, completely surrounded by the gonad except at the narrow distal end, which reaches a little beyond the level of the velar opening. The musculature of the subumbrella is particularly powerful.

The complete absence of tentacles might indicate that this was a *Pennaria*, but the presence of a well-developed apical canal points rather to the tubulariid medusae formerly named *Amalthaea*, which are abortive medusoids derived from hydroids of the genus *Corymorpha*.

Euphysora furcata Kramp 1948

(Pl. I, fig. 2)

1948*a* *Euphysora furcata* Kramp, p. 19, figs. 7–8 (Plate).

OCCURRENCE: St. 250. 17. vi. 27. 36° 09′ S, 05° 33′ W. East of Tristan da Cunha. Net: TYF 300(–0) m. 1 specimen. St. 1586. 2. v. 35. 02° 39′ 24″ N, 50° 46′ 24″ E. Off Somaliland, East Africa. Net: TYFB 550–0 m. 1 specimen. St. 1604. 29. x. 35. 21° 34′ 24″ S, 08° 09′ 48″ E. Off Walvis Bay, South-West Africa. Net: TYFB 182–0 m. 1 specimen.

In the specimens from the two first mentioned localities, the main tentacle is well extended showing the twice dichotomously branched terminal end with its four nematocyst knobs. In one point they differ from the type specimen: there is no indication of perradial divisions of the gonad, which completely encircles the stomach. In both specimens, which are 4–4·5 mm. high, the tentacle opposite the main tentacle is half as long again, thin and unbranched, and the two lateral tentacles are short and conical. In the third specimen, which is 8 mm. high and 6·5 mm. wide (St. 1604), the tentacles are much contracted (Pl. I, fig. 2). This specimen, therefore, resembles *Euphysora valdiviae* Vanhöffen (1911, p. 198). In my original description (1948*a*) I compared these two species, and I still maintain my previous statement that 'if Vanhöffen's description is not altogether wrong, the two medusae cannot belong to the same species'. From a superficial examination, the present specimen might be mistaken for *E. valdiviae* (as a matter of fact, my footnote (1948*a*, p. 20) alludes to this specimen), but in contradistinction to *E. valdiviae* the tentacle opposite the main tentacle has a thread-like prolongation, the branches of the main tentacle have nematocyst knobs, and there is no trace of

the hook-like process at the base of the tentacle, emphasized by Vanhöffen as a characteristic structure of his species. The peculiar four perradial and eight adradial nematocyst tracks on the exumbrella, forming anastomoses towards the apex (described by Vanhöffen), are not seen in any of the specimens observed by me. On the other hand, twelve meridional furrows run almost from the base to the summit of the exumbrella; they do not branch, and there are eight adradial and four interradial furrows, but no perradial. There is still the possibility that Vanhöffen's description is misleading and if so *E. valdiviae* must be regarded as an obsolete species.

DISTRIBUTION. The original specimen was taken south of the Newfoundland Bank; I have seen several specimens from other parts of the Atlantic Ocean, and one of the Discovery specimens was taken in the Indian Ocean, off the coast of East Africa.

Euphysora gigantea sp.n.

(Pl. I, figs. 3, 4)

OCCURRENCE: St. 78. 12. vi. 26. 35° 18′ 00″ S, 19° 01′ 10″ W. South Atlantic. Net: TYF 1000(–0) m. 1 specimen.
St. 1972. 28. ii. 37. 52° 11′ S, 52° 33′ 42″ W. East of Falkland Islands. Net: TYFB 2100–1400 m. 1 specimen.
St. 1995. 13. iii. 37. 61° 21′ 06″ S, 25° 49′ 12″ W. South of South Sandwich Islands. Net: TYFB 1800–1300 m. 3 specimens.
St. 2001. 16. iii. 37. 67° 04′ 24″ S, 19° 41′ W. Weddell Sea. Net: TYFB 1750–1300 m. 2 specimens.
St. 2006. 19. iii. 37. 66° 16′ 42″ S, 13° 23′ 18″ W. Weddell Sea. Net: TYFB 1750–1400 m. 4 specimens.
St. 2008. 20. iii. 37. 66° 06′ 30″ S, 06° 45′ 36″ W. Weddell Sea. Net: TYFB 1500–1300 m. 2 specimens.

Size of the specimens

Station	78	1972	1995			2001		2006			2008	
Height (mm.)	17	20	17	22	23	26	26	11	19	23	8	12
Diam. (mm.)	17	18	17	22	23	28	28	8	19	23	8	12

The specimen, 23 mm. high and wide, from St. 1995 is chosen as the *holotype*.

DESCRIPTION. Umbrella about as high as wide, globular, the gelatinous substance very thick, umbrella-cavity narrow, about half as high as the umbrella. Manubrium cylindrical or slightly barrel-shaped, its length one-half to two-thirds that of the umbrella cavity, surrounded from its base almost to the distal end by a ring-shaped gonad, leaving only a short cylindrical mouth tube. Mouth opening simple, circular, with a slightly everted margin. No apical canal. Four radial canals and ring-canal moderately broad, their endodermal cells not vacuolated. Velum narrow. Only one marginal tentacle, no rudimentary bulbs in the three other perradii. The tentacle has a well-developed conical basal bulb; the tentacle is very long and thin, carrying several bifurcated lateral branches separated by long intervals.

In most of the specimens the tentacle is lost, and even in the best preserved specimen (the type) the distal end is lacking, so that the full length of the tentacle remains unknown. In the type specimen, the number of lateral branches in the existing part of the tentacle is seven, increasing in size from the basal towards the distal part. Each branch consists of a basal trunk and two diverging branches of about the same length as the trunk. The tentacle is hollow with a fairly thick mesogloea. The ectodermal epithelium has entirely disappeared, so that the distribution of the nematocysts cannot be determined. The endodermal cells of the bifurcated branches contain protoplasm and nuclei (Pl. I, fig. 4); presumably they have carried nematocysts, but none of these are left.

According to notes on some of the labels, the colour of the manubrium and the radial canals is a bright, brilliant, deep orange.

DISTRIBUTION. This is evidently an antarctic species. Most of the specimens were taken in deep water south of the Antarctic Convergence, but one specimen was found farther north (St. 78) at a depth of less than 1000 m. in the antarctic intermediate water, which flows northwards below the warmer subantarctic water.

Ectopleura sacculifera sp.n.

(Pl II, figs. 1–3)

OCCURRENCE: St. WS 720. 1. viii. 31. 02° 52′ 18″ S, 82° 19′ 30″ W. Off the Pacific coast of Ecuador. Net: N 50 V, 100–0 m. 1 specimen, the *holotype*.

DESCRIPTION. Umbrella 3 mm. high, slightly conical, diameter in basal part 1·75 mm., jelly thick throughout the length of the umbrella. Exumbrella with eight nematocyst tracks issuing in pairs from the four marginal bulbs, soon divergent and continued at equal distances upward almost to the apex, which is a little depressed. The nematocyst tracks fairly broad below, tapering upward, running along the edges of eight prominent adradial ridges, separated by well-marked perradial and interradial grooves. Manubrium half as long as the height of the umbrella-cavity, with a quadrangular base broadly attached to the subumbrella. No gastric peduncle. Mouth tube narrow, mouth a simple circular opening with a slightly thickened rim. Stomach circular in transverse section, completely surrounded by the gonad, which forms four large interradial sac-shaped pouches hanging down from the middle portion of the manubrium almost to the level of the mouth.

No apical canal; four radial canals and ring-canal narrow. Velum narrow. Two opposite moniliform tentacles with large, conical basal bulbs and two rudimentary marginal bulbs.

The most characteristic features of this species are the four large, pendent gonadial sacs on the stomach wall. Similar structures occur in two other medusae (belonging to the same family, but which are in other respects entirely different from *Ectopleura*), namely, the Japanese species *Gotoea typica* Uchida (1927*b*, p. 195) and an undescribed South African species of the genus *Paragotoea* Kramp.

The single specimen of the present species was taken in the tropical East Pacific not far from the coast of Ecuador.

Family CYTAEIDAE

Cytaeis tetrastyla Eschscholtz 1829

OCCURRENCE: St. 282. 12. viii. 27. 01° 11′ S, 05° 38′ E. Gulf of Guinea. Net: TYF 300(–0) m. 2 specimens.
St. 677. 28. iv. 31. 31° 16′ 15″ S, 29° 56′ 30″ W. Off southern part of Brazil. Net: TYFB 420–0 m. 1 specimen.
St. 691. 8. v. 31. 00° 25′ 45″ S, 29° 56′ W. South of St Paul's Rocks. Net: TYFB 400–0 m. 2 specimens.
St. 694. 10. v. 31. 04° 05′ 30″ N, 30° 00′ W. North of St Paul's Rocks. Net: TYFB 210–0 m. 4 specimens.
St. 701. 16. x. 31. 14° 39′ 18″ N, 25° 51′ 21″ W. Near Cape Verde Islands. Net: TYFB 242–0 m. 48 specimens.
St. 705. 20. x. 31. 00° 03′ 24″ N, 30° 36′ 48″ W. North-east of Cape San Roque, Brazil. Net: TYFB 150–0 m. 1 specimen.
St. 707. 22. x. 31. 06° 44′ S, 33° 33′ W. Off Cape San Roque, Brazil. Net: TYFB 182–0 m. 1 specimen.

The specimens vary in size from 1·5 to 5 mm. in diameter. Those from Stations 677, 691 and 694 (28. iv–10. v. 1931) carry medusa buds on the stomach wall; the specimens from Station 282 (12. viii. 27) and Stations 705 and 707 (20–22. x. 31) have no buds. Among the forty-eight specimens from Station 701 (16. x. 31), 29 have medusa buds.

DISTRIBUTION. Widely distributed in all tropical seas. The localities, where this species was collected by 'Discovery' and 'Discovery II', are scattered over the tropical belt of the Atlantic between Africa and South America.

Family RATHKEIDAE

Rathkea africana sp.n.

(Pl. I, fig. 5)

OCCURRENCE: St. 282. 12. viii. 27. 01° 11′ S, 05° 38′ E. Gulf of Guinea, near St Thomas. Net: TYF 300(–0) m. 1 specimen, the *holotype*.

DESCRIPTION. Height of umbrella 1·7 mm., diameter 1·2 mm. Umbrella almost cylindrical, evenly vaulted at the top. Jelly very thin (probably shrunk by preservation), no apical projection and no gastric peduncle. Manubrium about one-third as long as the umbrella cavity, cruciform in transverse section. Gonads adradial, smooth, separated by deep grooves in the interradii. Small medusa buds present on the lateral sides of the gonads. Oral lips bifurcated, each with two large and broad terminal clusters of nematocysts; no lateral clusters. Four radial canals and ring-canal very narrow; velum? (crumpled). The eight marginal bulbs small, containing no pigment granules; three or four tentacles in each of the perradial groups, two or three in the interradial. In each group, one of the tentacles, the median one, large and stout, almost as long as the height of the umbrella; the second tentacle about half as long, the third and fourth very small.

In the preserved condition the medusa is colourless, apart from a distinct dark-brown line on either side of the interradial grooves of the manubrium.

This species differs from the northern *Rathkea octopunctata*, as well as from the subantarctic *R. formosissima*, in the absence of an apical projection and a gastric peduncle; in the interradial division of the gonads; in the narrow shape of the marginal bulbs, which are, moreover, destitute of pigmentation; further, in the very uneven size of the tentacles in each group. As far as the oral arms are concerned, they are entirely different from those in *R. formosissima*, and in comparison with *R. octopunctata* the oral arms of the present new species are considerably broader and they have no lateral clusters of nematocysts.

It would be a surprise to find either of these two species in a tropical locality like the Gulf of Guinea. One tropical species of the genus, *R. rubence*, has recently been described from the south-west coast of India by Nair (1951, p. 54, Pl. I, figs. 2–3). It is very similar to *R. octopunctata* except in the shape of the perradial corners of the mouth opening, which are 'developed into swollen lobes' and not drawn out into bifurcated mouth-arms. Thus the medusa from the Gulf of Guinea, *Rathkea africana* sp.n., differs in several respects from all hitherto described species of this genus.

Family BOUGAINVILLIIDAE

Koellikerina maasi (Browne 1910)

1910 *Koellikeria maasi* Browne, p. 22. Pl. 4, figs. 1–5.
1912*a* *Koellikeria maasi* Vanhöffen, p. 361. Pl. 25, fig. 2.
1939 *Koellikerina maasi* Kramp, p. 512.

OCCURRENCE: St. 1867. 10. xi. 36. 61° 37′ 36″ S, 43° 56′ 06″ W. Weddell Sea. Net: TYFH 500–450 m. 15 specimens.

Owing to the contraction of the umbrella-margin in the specimens examined by him, Browne was afraid that his figure of the entire medusa (1910, Pl. 4, fig. 2) might not be quite correct; as a matter of fact it is a perfect image of the present better-preserved specimens. I have nothing to add to Browne's thorough description.

DISTRIBUTION. McMurdo Sound (Browne); Gauss Station (Vanhöffen). The occurrence of several specimens in the Weddell Sea confirms the view that this is a truly antarctic species.

Bougainvillia macloviana Lesson 1843

Occurrence: St. 58. 19. v. 26. Port Stanley, East Falkland Islands. Net: N 70 H, 5–0 m. 200 specimens.
St. 719. 13. xi. 31. 54° 00′ S, 60° 00′ W. Net: N 100 B, 109–0 m. 11 specimens.
St. Sparrow Cove, Falkland Islands. 19. x. 34. 4–6 m. 5 specimens.
St. 1896. 27. xi. 36. 49° 55′ 06″ S, 62° 05′ W. Net: N 70 B, 128–0 m. 1 specimen.
St. 1897. 27. xi. 36. 49° 55′ S, 63° 09′ 24″ W. Net: N 100 B, 151–0 m. 5 specimens.
St. WS. 798. 20. xii. 31. 47° 31′ 30″ S, 65° 02′ W. Net: NCS-T, 49–66 m. 1 specimen.

All these localities are round or near the Falkland Islands.

The specimens taken in October, November and December are 7–16 mm. in diameter. Among the numerous specimens taken in May 1926 (St. 58) a few measure 9 mm. in diameter, but most of them are small, down to 1 mm.

Distribution. Widely distributed and very common in subantarctic and antarctic seas, probably circumpolar. Moreover, the medusa has been found in the south-eastern part of the North Sea; this occurrence is undoubtedly due to the transportation of the hydroid by ships.

Bougainvillia platygaster (Haeckel 1879)

(Plate III, figs. 1–6, text-fig. 1)

1879 *Hippocrene platygaster* Haeckel, p. 91.
1910 *Bougainvillia platygaster* Mayer, p. 165.
1912*a* *Bougainvillia niobe* Vanhöffen, p. 359.
1938*a* *Bougainvillia platygaster* Thiel, p. 299.
1948*b* *Bougainvillia niobe* Kramp, p. 4.
1951*a* *?Bougainvillia carolinensis* Vannucci, p. 78; 1951*b*, pp. 111, 114, 116.

Occurrence: St. 680. 30. iv. 31. 22° 36′ S, 30° 01′ 30″ W. Net: TYFB 260–0 m. 14 specimens.
St. 683. 2. v. 31. 16° 48′ S, 29° 55′ W. Net: TYFB 290–0 m. 1 specimen.
St. 688. 5. v. 31. 09° 26′ 30″ S, 29° 50′ 30″ W. Net: TYFB 450–0 m. 1 specimen.
St. 708. 23. x. 31. 10° 20′ 36″ S, 34° 54′ 42″ W. Net: TYFB 208–0 m. 1 specimen.
St. 709. 24. x. 31. 14° 01′ 24″ S, 36° 30′ 42″ W. Net: TYFB 216–0 m. 5 specimens.
St. 1374. 24. v. 34. 31° 46′ 36″ S, 29° 46′ 18″ E. Net: TYFB 230–0 m. 3 specimens.
St. 1375. 25. v. 34. 34° 30′ 48″ S, 26° 19′ E. Net: TYFB 210–0 m. 3 specimens.
St. 1574. 23. iv. 35. 21° 44′ 36″ S, 40° 33′ 42″ E. Net: TYFB 600–0 m. 1 specimen.
St. 1578. 26. iv. 35. 11° 25′ 12″ S, 42° 03′ 06″ E. Net: TYFB 500–0 m. 1 specimen.
St. 1580. 27. iv. 35. 08° 44′ 36″ S, 41° 50′ 18″ E. Net: TYFB 450–0 m. 1 specimen.
St. 1581. 28. iv. 35. 07° 42′ 06″ S, 44° 14′ 06″ E. Net: TYFB 600–0 m. 2 specimens.

The distribution of *Bouganvillia platygaster* is shown in Text-fig. 1. Stations 680–709 are off the east coast of Brazil; stations 1374–1581 are off the southern part of the east coast of Africa between Port Elisabeth and Zanzibar. Three of the specimens (Stns 680 and 683) are infested by parasitic narcomedusa-larvae (see p. 90).

The species *Bougainvillia platygaster* has been observed only on few occasions, and its identity has been doubted. Haeckel found it during his stay in 1866 in the Canary Islands. While preparing his monograph *Das System der Medusen* (1879) he borrowed the whole collection of medusae from the Zoological Museum of Copenhagen, together with a detailed list of localities and other information, and this list is still in our possession with Haeckel's hand-written identifications of the species. Many of the specimens are likewise still available in our collections, and among them three specimens of *B. platygaster* from the following two localities, both mentioned in Haeckel's book:

(1) Two specimens collected by Andrea in 1869 at 25° S, 27° W, south of the Brazilian island of Trinidad. In one specimen the manubrium is lost, but the tentacles are retained. The other

Text-fig. 1. Distribution of *Bougainvillia platygaster*. New records = ●, previous records: H = Haeckel, 1879; V = Vanhöffen, 1912*a*; T = Thiel, 1938; K = Kramp, 1948*b*.

specimen is well preserved (in alcohol); it is 12 mm. high and wide, with about 12 tentacles in each of the perradial bundles. The stomach has the very flattened shape mentioned in the description, and it carries a great number of medusa buds, although this fact seems to have escaped Haeckel's attention. As Haeckel's original specimen from the Canary Islands has presumably disappeared, I designate this specimen as the *neotype*.

(2) The other locality mentioned by Haeckel as 'in der Nähe der Kap Verden' is about 700 miles north-west of these islands (24° N, 33° W). From this locality we have one specimen collected by Iversen in 1871. It is about 12 mm. high and wide and badly preserved, but it evidently belongs to the same species.

Thiel (1938*a*) has referred a specimen, taken in the middle of the Atlantic Ocean between the Cape Verde Islands and the West-Indies (17° 53′ N, 39° 19′ W) to *B. platygaster*. This is the only record of the species since it was described by Haeckel. Medusa buds were not observed by Thiel.

It has generally been supposed that *B. niobe* Mayer was the only species of *Bougainvillia* which propagated by budding. Vanhöffen (1912*a*) therefore referred a specimen taken in the South Atlantic (about 24° S, 21° W) to *B. niobe*, but evidently from his description it belongs more properly to *B. platygaster*. My previous identification of a specimen with medusa buds (taken by the Swedish Antarctic Expedition off the Brazilian coast in 17° 32′ S, 34° 55′ W) as *B. niobe* must now be corrected to *B. platygaster*, and some young stages recorded from the same region by Vannucci (1951*a*) as *B. carolinensis* are also possibly the same species.

Before I proceed to a description of the peculiar asexual propagation of the 'Discovery' specimens, some remarks on the general morphology of *B. platygaster* as compared with other species of the genus are necessary.

In *B. platygaster* the umbrella is about as high as wide, with a very thick jelly, somewhat flattened above and with approximately vertical sides. It is not cubical as stated by Haeckel; in cross-section it is almost circular with only a slight indication of flattening of the interradial sides. The specimens taken off the Brazilian coast are 4–11 mm. high and wide, the East-African specimens 5–7 mm. Without exception, in all the specimens the stomach has the very flat shape which is characteristic of this species. In one or two specimens the mouth tube protrudes slightly as a short and narrow prismatic tube, while the stomach itself is quite flat; in all the others the mouth is widely open at the lower level of the stomach.

Almost all the specimens are immature, with the stomach quadrangular in shape with straight or slightly concave sides. Two specimens, a male and a female, have well-developed sexual products, and their gonads are decidedly interradial. In the male (Pl. III, fig. 1) the stomach is slightly, in the female somewhat more concave interradially, but there is no interradial interruption of the gonads. Although the upper surface of the stomach is broad and flat, it is attached to the subumbrella along the arms of a perradial cross. There is no indication of a gastric peduncle.

The oral tentacles branch dichotomously immediately from their points of origin; there is no unbranched basal portion or 'trunk'. In the larger specimens they branch 5–6 times. There are 7–9 marginal tentacles in each of the perradial bundles in specimens less than 7 mm. wide; 9–13 in the larger specimens. The ocelli are crescent-shaped with the concavity turned outwards.

I cannot see any morphological difference between the specimens from the two geographical areas represented in the present collection.

The species of *Bougainvillia* which might possibly be confounded with *B. platygaster* are *B. carolinensis*, *fulva*, and *niobe*.

B. carolinensis (McCrady 1857) occurs along the Atlantic coast of North America, from Woods Hole to Florida, and recently it has been recorded, though with a query, from the Brazilian coast, in

25° S, 47° 51′ W, by Vannucci (1951*a* p. 78, 1951*b* pp. 111, 114, 116). Only very young stages were observed, less than 1 mm. in diameter; accordingly, the identification seems uncertain; they may be young specimens of *B. platygaster*.[1] The most recent description of *B. carolinensis* was given by Mayer (1910, p. 165, Pl. 16, figs. 7–9, Pl. 17, fig. 7). This is a small medusa, 4 mm. in height. The gonads are interradial as in *B. platygaster*, but the manubrium is long and narrow, and the oral tentacles have a long, undivided shaft. An identity between these two species therefore seems excluded. Recently also recorded from the Gulf of Guinea (Kramp 1955, p. 249).

B. fulva Agassiz & Mayer 1899 is an Indo-Pacific species. In size and general appearance it is very similar to *B. platygaster*, but the stomach is usually longer, about half as long as the height of the bell-cavity, though sometimes shorter (Maas 1905, Pl. I, fig. 8). In young specimens the stomach may be quadrangular (Maas 1905, Pl. II, figs. 10*a*, *b*), but in mature specimens the gonads are distinctly adradial, and widely separated in the interradii (Maas 1905, Pl. II, fig. 10*c*; Kramp 1928, text-fig. 21). In this respect the species differs from *B. platygaster*. Though numerous specimens have been examined by several authors, budding has never been observed.

B. niobe Mayer 1894 occurs off the southern Atlantic coast of North America, from Chesapeake Bay to Florida, and round Bermuda and the Bahama Islands. As mentioned above, the records from the waters off the Brazilian coast are probably all referable to *B. platygaster*. *B. niobe* was well described and figured by Mayer (1910, p. 166, Pl. 18, figs. 1–3, text-fig. 90) and was re-examined by Bigelow (1918, p. 368 and 1938, p. 104). In this species also the stomach is about half as long as the height of the bell-cavity, and the gonads are distinctly adradial. This is especially emphasized by Bigelow, who pointed out the almost complete agreement between *B. niobe* and *B. fulva*; the only difference seems to be the ability of the former to produce medusa buds, which have never been seen in *B. fulva*. Mayer's figures show that *B. niobe* differs further from *platygaster* in the branching of the oral tentacles, which have a fairly long, unbranched, basal trunk before the first bifurcation, whereas in *B. platygaster* they bifurcate immediately after they issue from the mouth tube. Moreover, the ocelli of *B. niobe* seem to be round, not crescent-shaped as in *platygaster*. The medusa buds of *B. niobe* are developed directly on the lateral sides of the stomach, not in clusters.

Thus *B. fulva* and *B. niobe* differ from *B. platygaster* mainly in the distinctly adradial position of their gonads and in the length of the manubrium. Even if the flat shape of the stomach should be due to contraction during preservation, it would be a remarkable coincidence if all the thirty-three specimens collected by 'Discovery II' showed in every case the same mode and degree of contraction. I have come to the conclusion that *Bougainvillia platygaster* is a species distinct from *B. fulva* and *B. niobe*.

Asexual propagation in *Bougainvillia platygaster*

Asexual budding was observed in twelve of the specimens of *Bougainvillia platygaster* collected by 'Discovery II'. It should at once be emphasized that all the specimens were immature. In the largest medusa buds, four long marginal tentacles can be seen curled or doubled up inside the umbrella-cavity and the manubrium carries four small, simple oral tentacles, each with a terminal cluster of nematocysts (Pl. III, figs. 5 and 6). Apparently the buds are produced in three different ways: (1) from pedicels of polypoid hydranths issuing from the corners of the manubrium of the medusa, (2) as outgrowths from stolonial structures, and (3) directly from the walls of the stomach, but investigation shows that there is no fundamental difference between them.

(1) The first method is unique so far among the Hydromedusae. It is seen in five specimens, 5–6 mm. wide, from the south and east coasts of Africa (Stations 1374, 1375 and 1581), and it also

[1] After the above was printed I met Dr M. Vannucci who told me that *B. carolinensis* actually occurs off the east coast of Brazil.

occurs in Haeckel's specimen from the West Atlantic, although Haeckel himself failed to observe it. In each of the four corners of the stomach of the medusa, adjacent to the bases of the radial canals, a typical, well-developed hydranth, mounted on a short pedicel, carries medusa buds as lateral outgrowths with fairly long pedicels (Pl. III, figs. 2–5). The hydranths are fairly broad, each provided with a circle of 10–12 tentacles and a circular mouth opening. They are also able to catch food, as seen in Pl. III, fig. 5, which shows a hydranth grotesquely expanded by a copepod which it has swallowed.

(2) In one of the specimens from St. 1581, off Zanzibar (Pl. III, fig. 6), no hydranths can be observed, but from the corners of the stomach filiform structures have grown outwards, adnate to the epithelium of the subumbrella, exactly like the stolon of a hydroid attached to a solid substratum. They are more or less branched and give rise to pedicels with medusa buds. In the specimen figured, the stolon carries two well-developed medusa buds; the stolon is adnate up to a point a little beyond the origin of the medusa buds, its terminal end being slightly elevated, the internal structure showing that it is in the act of developing into a medusa. The small outgrowth on the right is in a juvenile, unmodified condition; it has no terminal cluster of nematocysts and therefore cannot be regarded as a blastostyle.

(3) Medusa buds situated on the walls of the stomach can be seen in the six specimens from Brazilian waters, three collected in April (St. 680) and three in October (St. 709). Some of the medusa buds are solitary, issuing directly from the stomach wall as in *B. niobe*, but most of them are collected in clusters on branched pedicels. Hydranths are not developed in these clusters, but the very fact that the pedicels of the medusa buds may be branched seems to indicate that they may be regarded as highly reduced stolonial or polypoid structures. This is the only method of budding found in the Brazilian medusae as well as in Haeckel's specimen (described under (1)) in which hydranths are also developed. It also occurs in the medusa from St. 1581, off Zanzibar (described under (2)), in which some of the medusa buds are also borne on stolonial outgrowths from the corners of the stomach.

Although examples of propagation by budding have previously been reported in numerous genera of medusae, the only instances at all comparable with *Bougainvillia platygaster* occur in the limnomedusa, *Proboscidactyla ornata*, and in the leptomedusa, *Phialidium mccradyi*.

Proboscidactyla ornata is a species common to all tropical coasts and in it medusa buds are found on the radial canals. The species has been divided into a number of varieties, or even species and subspecies, based on the position of these buds, which may be either adjacent to the corners of the stomach, or else arise on the first, second or third forking of the radial canals. In every case the medusa buds do not arise directly from the tissues of the radial canals but from a blastostyle, which is a polypoid structure. These buds were first seen by T. Huxley (1877, p. 132, fig. 17) in an unidentified '*Willia*' (*Proboscidactyla*). He described them as issuing from small 'stolons', each terminating in a 'knobbed extremity containing many nematocysts'. Huxley's observations were quoted by Browne (1904, p. 727). In a later paper Browne (1916, p. 184) called Huxley's 'stolons' 'blastostyles', a decidedly better term. The occurrence of these structures has been reported subsequently by several other authors, and in 1951, while in the Philippines with the Danish 'Galathea' Expedition, I found numerous specimens of *Proboscidactyla ornata* with medusiferous blastostyles in every possible position on the canals. Pl. III, fig. 7 shows one of these structures which I have observed. It is certainly a blastostyle, a polypoid individual corresponding to the blastostyles on which the gonophores are developed in many hydroid colonies.

In *Phialidium mccradyi* also, medusiferous blastostyles have been found to occur (Brooks, see Mayer, 1910, p. 271, Pl. 34, figs. 2, 3, Pl. 35, figs. 1–3), but in this instance they arise from the immature gonads and are enclosed in gonothecae.

I have already pointed out (p. 13) that the budding structures in *Bougainvillia platygaster* cannot be regarded as blastostyles. Consequently, we have here a method of asexual propagation different from the one met with in the two species just described. Nor can the polyps produced by *B. platygaster* be compared with the actinulae of *Hybocodon* or *Margelopsis* for example. Actinulae are developed from fertilized eggs, which have remained attached to the stomach wall of the medusa, whereas I would emphasize again that in all the budding specimens of *B. platygaster* the gonads were immature.

Although in *B. platygaster* medusa buds arise in three apparently different ways, it must be remembered that an outgrowth on any polypoid structure of a hydrozoan is initially unmodified. Its future is usually predestined by its position on the colony, which indicates whether it will develop into a stolon, a hydranth, a blastostyle or a gonophore. Heteromorphic development, however, often occurs, one of the most frequent results of which leads to the development of a stolon from a bud destined to become a hydranth, and Berrill (1949) has demonstrated that heteromorphism can be due to environmental factors.

In *B. platygaster*, clearly, we have three examples of heteromorphism occurring within a single species. The branched structures described as issuing from the corners of the stomach of the medusa, each carrying a hydranth (sometimes two), are comparable with small hydroid colonies.

In the specimen from St. 1581 (described under (2)) in which no hydranths are developed, the whole 'colony' issuing from the corner of the stomach has been transformed into a creeping stolon adnate to the subumbrella of the medusa. The formation of a terminal hydranth is inhibited and medusa buds issue directly from the stolon. These two structures invariably arise from the corners of the stomach.

Where outgrowths from the lateral walls of the stomach (described under (3)) have no possibility of attachment to a substratum, no stolons and no hydranths are formed but only a cluster of medusa buds on branched pedicels. These may be regarded as completely reduced polypoid colonies.

Although the formation of hydranths by asexual budding from a medusa is contradictory to our usual concept of the normal developmental cycle in hydromedusae, the budding in *Bougainvillia platygaster* forces us to abandon the idea that the asexual offspring of a medusa must always be other medusae.

Family PANDEIDAE

Merga rubra sp.n.

(Pl. II, fig. 4)

OCCURRENCE: St. 661. 2. iv. 31. 57° 36′ S, 29° 54′ 30″ W. North of the South Orkney Islands. Net: TYFV 500–250 m. 1 specimen, the *holotype*.

In spite of the poor condition of the single specimen, it must be described as a new species. The umbrella is 7 mm. high, including the slender and pointed apical projection; the diameter is about 4·5 mm. The walls of the umbrella are fairly thick. The stomach is about three-fifths as long as the height of the bell-cavity and very broad; the perradial edges are attached to the radial canals along more than half the length of the stomach. The oral lips have disappeared. A broad conical apical chamber leads upwards into the gelatinous apical projection. The gonads are mutilated; apparently they are smooth, but their size cannot be gauged; they contain many fairly large eggs. The four radial canals and the ring-canal are fairly narrow. There are two opposite marginal tentacles with very large conical basal bulbs; ocelli not seen. Moreover, there are six rudimentary tentacles, or tenaculae, slender and tenon-like, solid; two of them are opposite to two of the radial canals, the others are interradial, one in each quadrant. Velum,? Colour: the stomach has a deep reddish brown colour, similar to that of many deep-sea medusae.

Owing to the configuration of the marginal tentacles this medusa might be referred to *Amphinema*, but owing to the very long mesenteries, I think we must place it in the genus *Merga*, at least provisionally. It differs from the other species of this genus by the interradial position of the gonads, by the rudimentary tentacles being developed into tenaculae, and by the possession of an apical chamber above the stomach.

Annatiara affinis (Hartlaub 1913)

1913 *Tiaranna affinis* Hartlaub, p. 269. Text-figs. 220–1.
1920 *Tiaranna affinis* Kramp, p. 6. Pl. 1, fig. 1.
1926 *Tiaranna affinis* Kramp, p. 68. Pl. 1, figs. 15–17.
1934 *Tiaranna affinis* Ranson, p. 436.
1940*b* *Annatiara affinis* Russell, p. 518.
1953 *Annatiara affinis* Russell, p. 200. Text-figs. 101–3.

Occurrence: St. 89. 28. vi. 26. 34° 05′ 15″ S, 16° 00′ 45″ E. South Africa. Net: TYF 1000(–0) m. 1 specimen, diam. 19 mm.
St. 691. 8. v. 31. 00° 26′ S, 29° 56′ W. Net: TYFB 400–0 m. 1 specimen, diam. 17 mm.
St. 697. 12. v. 31. 09° 15′ N, 30° 02′ W. Net: TYFB 460–0 m. 2 specimens, diam. 12–13 mm.

Distribution. This is an oceanic medusa, occurring mainly in the intermediate water masses. It has been recorded from west of the British Isles and from the Bay of Biscay, and I have seen a specimen taken off Liberia, on the west coast of Africa. The first of the Discovery localities is off the southern part of the west coast of Africa, the two others from the central part of the Atlantic Ocean, between the Cape Verde Islands and Cape St Roque, South America.

Halitholus intermedius (Browne 1902)

1902 *Tiara intermedia* Browne, p. 277.
1939 *Halitholus intermedius* Browne & Kramp, p. 288. Pl. 14, fig. 7, Pl. 16, figs. 1–2.

Occurrence: St 100. 2. x. 26. 33° 20′ S, 15° 18′ E to 33° 46′ S, 15° 08′ E. Net: TYF 475(–0) m. 1 specimen, diam. 5 mm.
St. 1374. 24. v. 34. 31° 46′ 36″ S, 29° 46′ 18″ E. Net: TYFB 230–0 m. 1 specimen, diam. 4 mm., height 6·5 mm.

I have compared these specimens with specimens from the Falkland Islands and found perfect agreement.

Distribution. Previously known only from the Falkland Islands, where this medusa is very common. The two localities mentioned above are off the coast of South Africa, one near Capetown, the other off the south coast. This subantarctic species is thus able to live in the cool water of the Benguela Current.

Leuckartiara octona (Fleming 1823)

1913 *Leuckartiara octona* Hartlaub, p. 285. Text-figs. 239–53.

Occurrence: St. 79. 13. vi. 26. 34° 48′ S, 16° 36′ W. North-west of Tristan da Cunha. Net: N 450 V 1000–0 m. 1 specimen.
St. 273. 31. vii. 27. 09° 38′ 00″ S, 12° 42′ 30″ E. Off Angola. Net: TYF 230–200(–0) m. 1 specimen.
St. 276. 5. viii. 27. 05° 54′ S, 11° 19′ E. Off Congo River. Net: TYF 150(–0) m. 2 specimens.
St. 280. 10. viii. 27. 00° 36′ S, 08° 28′ E. Off French Congo. Net: TYF 200–100(–0) m. 1 specimen.
St. 701. 16. x. 31. 14° 39′ 18″ N, 25° 51′ 42″ W. Near Cape Verde Islands. Net: TYFB 242–0 m. 2 specimens.

Dimensions of the specimens

Station	79	273	280	701	701
Height of umbrella (mm.)	10	11	10	10	10
Diam. of umbrella (mm.)	9	9	7	9	10
No. of tentacles	20	19	?	22	22

In some of the specimens there is only one rudimentary tentacle between successive fully developed tentacles, in others there are 1–3. Ocelli are not seen, but for comparison I examined specimens from North European waters and found that the ocelli frequently disappear after prolonged preservation. The agreement between the present specimens and those from northern waters is so perfect that I have no doubt of the correctness of the identification.

Distribution. This species has a very extensive distribution. It is abundant in North-West European waters as far north as Iceland. It also occurs in the Mediterranean and on the east coast of North America, and it is further recorded from the coasts of India, Malaya, Japan, the Philippines, and North-East Australia and from Vancouver on the west coast of North America. It has now been found for the first time off the west coast of Africa. The occurrence in the neighbourhood of the island of Tristan da Cunha in the middle of the South Atlantic (St. 79) is of particular interest.

Leuckartiara annexa sp.n.

(Pl. II, figs. 5, 6)

Occurrence: St. 439. 21. ix. 30. 30° 12′ S, 32° 24′ E. Near Durban, South-East Africa. Net: N 100 B 110–0 m. 1 specimen, the *holotype*.

St. 1576. 25. iv. 35. 14° 42′ S, 42° 22′ 12″ E. Off Mozambique, East Africa. Net: TYFB 400–0 m. 1 specimen.

The specimen from St. 439 is chosen as the *holotype*. Umbrella 11 mm. in height, 9 mm. in diameter, regularly dome-shaped with almost perpendicular sides, no apical gelatinous projection, walls fairly thin. Manubrium very large, almost filling the umbrella-cavity, oral lips large and complexly folded, protruding somewhat below the level of the bell margin. The four perradial edges of the stomach are connected with the radial canals along their upper half. The gonads occupy the entire walls of the stomach; they contain numerous ripe eggs. The gonads are interradial, each consisting of two lateral rows of transverse folds, about ten in each row, directed a little upward in the upper half, and downward in the lower half. The two rows of folds are separated by a narrow interradial groove, which is interrupted by the transverse bridge characteristic of *Leuckartiara* and related genera. In the present species the transverse bridge is placed in the middle part of the stomach wall, at an equal distance from the proximal and from the distal end of the stomach. The radial canals are moderately broad with slightly undulated edges. The ring-canal is fairly narrow. Velum narrow.

There are four perradial and four interradial tentacles of about equal size, with large, elongated, somewhat laterally compressed basal bulbs; the base of the bulb clasps the umbrella-margin forming a short abaxial spur. Ocelli are not seen. There are also eight adradial tentacles, much smaller than the others, and of a peculiar shape not seen in any other species of this genus. They have no basal swelling; their proximal part is narrow, adnate to the umbrella-margin and continued rather far upward on the exumbrella, whence a short filiform tentacle projects upward and outward. Alternating with the tentacles are 16 minute rudimentary bulbs.

The other specimen (St. 1576) is small, only 3 mm. high and wide. The manubrium is only half as long as the height of the bell cavity. The four interradial tentacles are somewhat smaller than the perradial. Some of the adradial tentacles are still quite small, the others are similar to those in the adult specimen.

Whereas the perradial and interradial tentacles of this medusa resemble the tentacles of most other species of *Leuckartiara*, the configuration of the adradial tentacles separates it from all other species and justifies the erection of a new species.

Neoturris pileata (Forskål 1775)

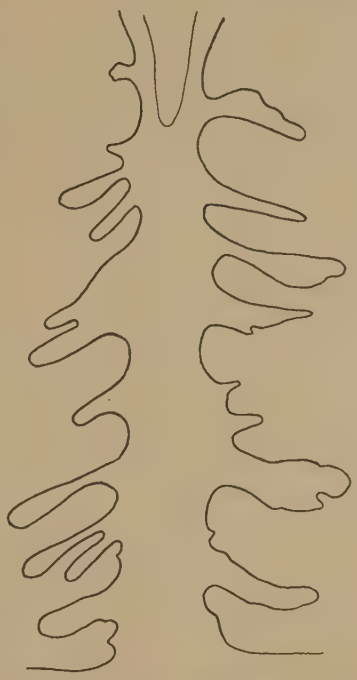
1913 *Neoturris pileata* Hartlaub, p. 326. Text-figs. 270–81.

Occurrence: St. 1606. 31. x. 35. 26° 15′ 48″ S, 12° 18′ E. Off Ichabo Island, South-West Africa. Net: TYFB 190–0 m. 1 specimen.

The specimen is very large, 35 mm. in diameter and 34 mm. in height, the apical projection slightly developed. The free, distal portion of the radial canals is about 19 mm. in length, provided with lateral diverticula of uncommon length, some of them about as long as the width of the canal (text-fig. 2). There are 80 marginal tentacles including a few small ones.

It was a surprise to find this North-Atlantic species so far south in the ocean. I have compared the specimen with several large examples from northern waters; in some of them the lateral diverticula of the radial canals are almost as long as in the present specimen, and in all other respects the agreement is perfect. The considerable length of the diverticula is most probably the consequence of growth beyond the usual size of this species. The structure of the gonads, the length of the 'mesenteries', the shape of the tentacle bulbs, and the number of tentacles are typical of *N. pileata* and leave no doubt of the identification.

Distribution. Common in the North-East Atlantic as far north as the south coast of Iceland and in the Mediterranean. Recorded with some doubt from the Philippines and from Vancouver on the west coast of North America. Now found for the first time off the west coast of Africa.



Text-fig. 2. *Neoturris pileata*: radial canal. Specimen from St. 1606.

Pandea conica (Quoy & Gaimard 1824)

1913 *Pandea conica* Hartlaub, p. 338. Text-figs. 286, 287.

Occurrence: 9. xi. 25. 01° 06′ N, 13° 05′ W. Net: N 200 H 0 m. 1 specimen.
St. 101. 15. x. 26. 33° 50′ S, 16° 04′ E to 34° 13′ S, 15° 49′ E. Net: N 450 V 1310–1410 m. 1 specimen.
St. 282. 12. viii. 27. 01° 11′ S, 05° 38′ E. Net: TYFB 300(–0) m. 6 specimens.
St. 702. 17. x. 31. 10° 59′ 18″ N, 27° 03′ 48″ W. Net: TYFB 236–0 m. 6 specimens.
St. 717. 2. xi. 31. 44° 42′ S, 53° 32′ 12″ W. Net: TYFB 212–0 m. 1 specimen.
St. 1600. 25. x. 35. 12° 43′ 18″ S, 00° 20′ 12″ E. Net: TYFB 400–330 m. 1 specimen.
St. 1770. 21. v. 36. 33° 49′ 06″ S, 05° 10′ 48″ E. Net: N 100 B 100–0 m. 1 specimen.

Young specimens, 2–3 mm. in diameter, were taken in August and October (Stns 282 and 702), larger specimens, 9–13 mm. wide, in October and November.

The occurrence at St. 717, off the southern part of the east coast of South America, is peculiar; the specimen is badly preserved, but careful examination has convinced me of the correctness of the identification.

Distribution. Very common in the Mediterranean; twice recorded from the neighbourhood of the Bermuda Islands (Bigelow 1918, p. 373 and 1938, p. 106); and from Japan and the Philippines. A record from the Agulhas Current south of Africa by Vanhöffen (1911, p. 209) seems to be correct. Recently recorded from the Gulf of Guinea (Kramp 1955, p. 251). The present specimens were taken off the west coast of Africa, between the Cape Verde Islands and Capetown. In addition, the specimen

mentioned above from a locality off the coast of Argentina, occurred far away from the other areas of distribution. All the specimens were taken in the upper water-layers, except at St. 101, where the depth of the haul is stated to be 1310–1410 m. The possibility exists that the single specimen was really caught at a higher level; on the other hand, in the Mediterranean the species may sometimes occur in rather deep water.

Pandea rubra Bigelow 1913

1913 *Pandea rubra* Bigelow, p. 14. Pl. 2, figs. 1–7.
1926 *Pandea rubra* Kramp, p. 96. Pl. 2, fig. 15.
1938 *Pandea rubra* Bigelow, p. 107.

Occurrence: St. 107. 4. xi. 26. 45° 03′ S, 17° 03′ E. South of Africa. Net: N 450 V, 850–950 m. Fragments of one large specimen.

St. 151. 16. i. 27. 53° 25′ S, 35° 15′ W. North of South Georgia. Net: N 450 V, 1275–1025 m. 1 specimen, diam. *c.* 80 mm.

St. 1131. 24. ii. 33. 54° 22′ 36″ S, 34° 08′ 24″ W. Weddell Sea. Net: N 70 V, 1000–800 m. 1 specimen, diam. 38 mm., height 36 mm.

St. 1989. 10. iii. 37. 55° 53′ 12″ S, 32° 46′ 48″ W. Weddell Sea. Net: TYFB, 1500–1200 m. 2 specimens, diam. 64 mm., height 58 mm.; diam. 62 mm., height 63 mm.

The specimens from the Weddell Sea (Stns 1131 and 1989) are in beautiful condition and have retained their deep reddish-brown colour. The exumbrellar jelly is fairly thick and very soft. There are no tracks of nematocysts on the exumbrella. The epithelium of the subumbrella consists of polygonal cells containing a dense mass of pigment granules; no muscular fibres are seen. As stated by Bigelow (1913) the radial canals are 'showing as pale bands'; they are very faintly pigmented except in their lateral notches, which are of a deep brown colour. The ring-canal is likewise pale, but the velum, which is very narrow, is dark. In the tentacles a dark brownish colour is seen in the endoderm. No ocelli are seen. On the label of St. 1989 is written: 'Exterior transparent when fresh, subumbrella deep reddish brown.'

As far as the number of tentacles is concerned, Bigelow (1938, p. 107) has compared specimens from the North-West Pacific with specimens from Bermuda and the North Atlantic. He found an indication that the Atlantic specimens had fewer tentacles than those from the Pacific, but he added: '. . . larger series might well show that there is actually no regional difference in this respect'. It is interesting to note that in the present specimens from the Weddell Sea the number is comparatively large:

Height of bell (mm.)	36	58	63
No. of tentacles	20	22	24

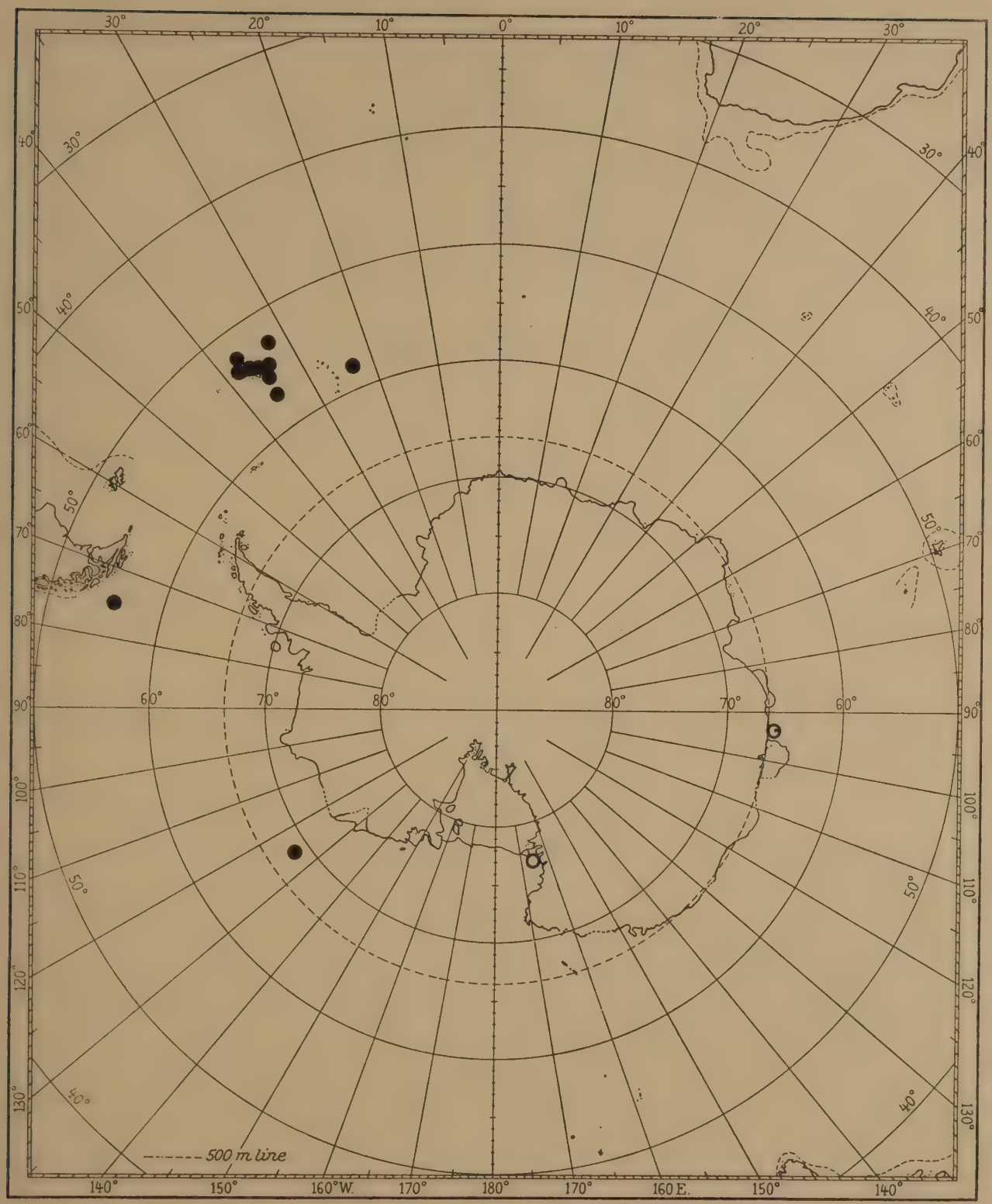
The largest specimen observed by Bigelow (1913, 75 mm. high) between San Francisco and Unalaska Island had about 20 tentacles.

Distribution. This beautiful medusa belongs to the deep and intermediate water-layers and has a very extensive distribution: North-West Pacific (Bigelow 1913); North-East Atlantic (Kramp 1926); Bermuda (Bigelow 1938). Its known area of distribution is thus greatly augmented by the finds mentioned above from the Weddell Sea and South Africa.

Zanclonia weldoni (Browne 1910)

1910 *Catablema weldoni* Browne, p. 13. Pl. I, figs. 1–5.
1912*a* *Catablema weldoni* Vanhöffen, p. 362. Pl. 24, fig. 3.
1913 *Zanclonia weldoni* Hartlaub, pp. 313, 348. Text-figs. 261, 262.

Occurrence: (Text-fig. 3) Stns 12, 133, 138, 139, 151, 825, 1050, near South Georgia.
St. 727. South-west of Cape Horn.



Text-fig. 3. Distribution of *Zanclonia weldoni*. New records= ●, previous records= ○.

St. 1298. 69° 15·7′ S, 125° 56·3′ W.

Stns WS 21, WS 22, WS 29, WS 57, WS 60, WS 61, WS 330, near South Georgia. St. WS 557, east of South Sandwich Islands. (For details, see Table I.)

Most of the 20 specimens are in excellent condition and confirm in every respect Browne's detailed description, except in the regular alternation of large tentacles and small marginal bulbs. These latter are seen in different stages of development into tentacles, and they are irregularly distributed among the fully developed tentacles. Two of the specimens are somewhat larger than any known up to now; they were collected at St. 727, near the south point of South America. One of them is 36 mm. high and 32 mm. in diameter, with 24 large tentacles and no small ones; the other specimen is 37 mm. high and wide, with 32 large tentacles and 10 small ones, irregularly distributed. Both specimens contain numerous eggs. The lateral diverticula of the radial canals are so long that they meet in the interradii, but they never fuse.

In small specimens, 5–6 mm. high, the diameter is about equal to the height; in medium-sized specimens, 8–18 mm. high, the umbrella is usually considerably higher than wide; variations in the ratio may be due to contraction during preservation. Again, in large specimens the diameter increases in proportion to the height; two specimens, 20–21 mm. high, are 23 mm. and 22 mm. wide and, as mentioned above, the two very large specimens from St. 727 are about as wide as high.

The majority of the specimens were collected in the neighbourhood of South Georgia in the summer months of November to February; they vary in size as follows:

Month	Nov.	Dec.	Jan.	Feb.
Height (mm.)	8–9	5–16	10–21	10–20

There is an indication that young specimens appear at the beginning of the summer and increase in size during the succeeding months, but the two very large specimens (St. 727) were taken in November 1931. Two specimens taken at St. 1298 on 2 March 1934 in the Pacific sector of the Antarctic are 14 mm. high and 8–10 mm. wide.

Distribution. Previously recorded from McMurdo Sound and Cape Adare (Browne) and from the Gauss Station (Vanhöffen). These records, in conjunction with those of the Discovery collections, indicate that this species has a circumpolar distribution in the antarctic seas.

Pandeidae spp. indeterminatae

Occurrence: St. 208. 7. iv. 27. 62° 49′ 30″ S, 60° 10′ 30″ W. Off Livingston Island, South Shetland. Net: TYF 800(–0) m. 1 specimen.

St. 707. 22. x. 31. 06° 44′ S, 33° 33′ W. Net: TYFB 182–0 m. 1 specimen.

St. 708. 23. x. 31. 10° 20′ 36″ S, 34° 54′ 42″ W. Net: TYFB 208–0 m. 1 specimen.

St. 709. 24. x. 31. 14° 01′ 24″ S, 36° 30′ 42″ W. Net: TYFB 216–0 m. 1 specimen.

St. 1585. 1. v. 35. 00° 06′ S, 49° 45′ 24″ E. Net: TYFB 500–0 m. 1 specimen.

Young and more or less mutilated specimens which could not be identified beyond referring them to this family were collected at the above localities.

Family Calycopsidae

Calycopsis borchgrevinki (Browne 1910)

(Text-fig. 4)

1910 *Sibogita borchgrevinki* Browne, p. 17. Pl. 2, figs. 1–5.

1911 *Calycopsis borchgrevinki* Vanhöffen, p. 215. Pl. 22, fig. 7, text-fig. 10*a*, *b*.

1912*a* *Calycopsis borchgrevinki* Vanhöffen, p. 364.

Occurrence: Stns 114, 115, 120, 151, 382, 395, 454, 662, 663, 666, 958, 1458, 1559. WS 20, WS 37, WS 385. (For details, see Table 1.)

Altogether 44 specimens of this well-known medusa were preserved. One of the specimens is very small, 3 mm. in diameter, and unfortunately it is badly preserved. The others range in size between 7 mm. and 24 mm. in diameter. As a rule the jelly is very firm.

The sizes of the preserved specimens in the different months of the year are as follows:

Month	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	April
Diam. (mm.)	11–17	12	10–24	7	18	21	9–23

These figures do not show any definite relation between the season and the size of the medusae.

Most of the localities are in the Atlantic sector, fairly evenly distributed between about 22° E and 45° W, in a belt between 48° and 56° S. St. WS 385 and St. 382 are in the neighbourhood of the South Shetlands. Stns 958 and 1458 are in the Pacific sector, between about 62° and 66° S.

Distribution. Antarctic and sub-antarctic, circumpolar; previously recorded from Cape Adare (Browne); between Bouvet Island and Enderby Land and north-west of Gauss Station (Vanhöffen).

Calycopsis bigelowi Vanhöffen 1911

(Text-fig. 4)

1911 *Calycopsis bigelowi* Vanhöffen, p. 218. Text-fig. 12.
1918 *Calycopsis bigelowi* Bigelow, p. 377.
1940 *Calycopsis bigelowi* Bigelow, p. 293.

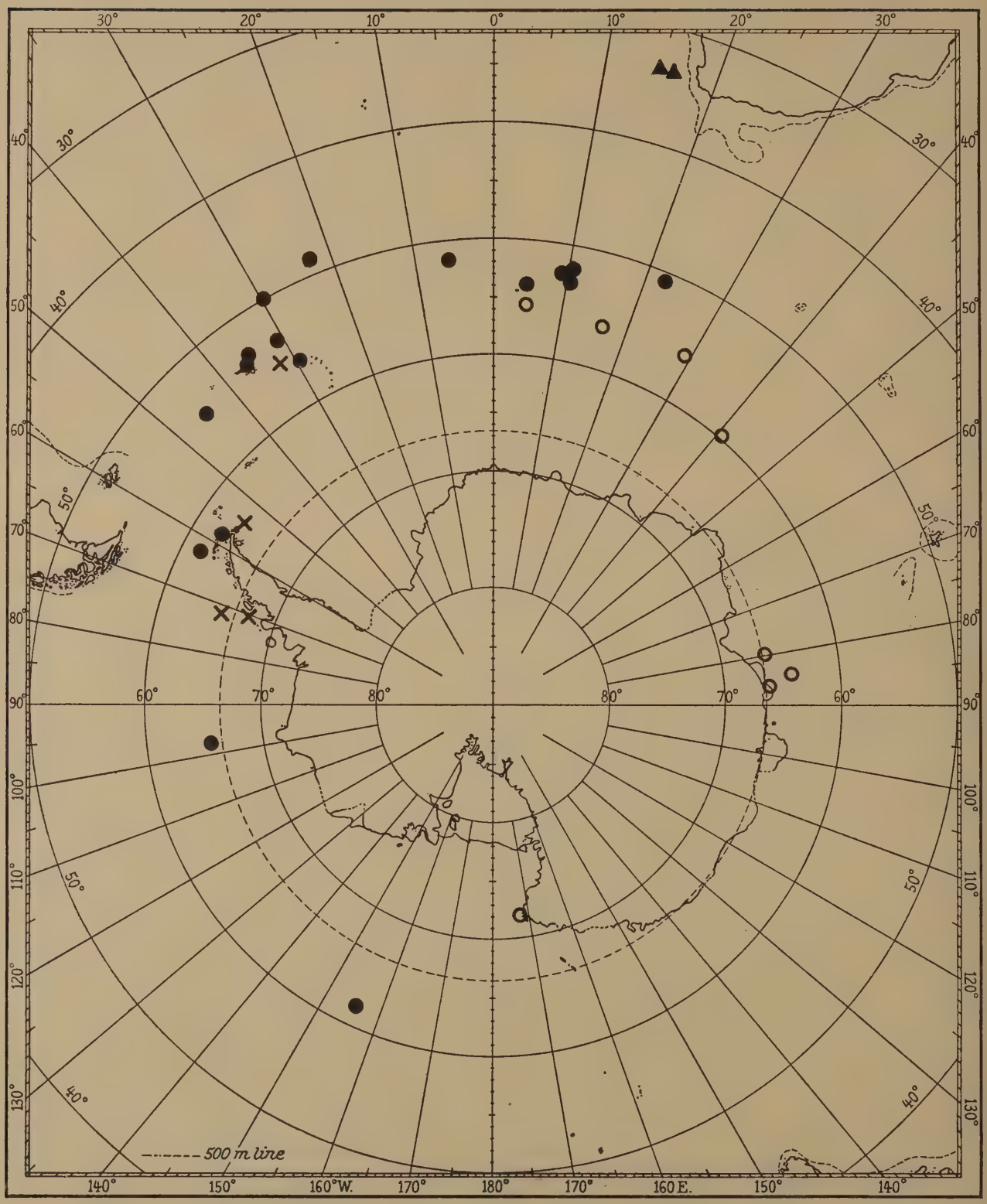
Occurrence: St. 100. 2–4. x. 26. 33° 20′ S, 15° 18′ E to 33° 46′ S, 15° 08′ E. Net: TYF 475(–0) m. 1 specimen. TYF 2500–2000 m. 1 specimen.

St. 101. 15. x. 26. 33° 50′ S, 16° 04′ E to 34° 13′ S, 15° 49′ E. Net: N 450 350–400(–0) m. 2 specimens. N 450 V 850–950 m. 1 specimen.

These localities are west of the Cape of Good Hope. A specimen belonging to the same species is labelled as follows: St. 983. 23. x. 32. 55° 10′ S, 76° 04′ 42″ W. Net: N 100 B 300–80 m. This is very peculiar. The locality is west of the south point of South America, and the haul was made in the upper water-layers, whereas in the other localities the specimens were taken at considerable depths. I cannot suppress a suspicion that some mistake may have taken place.

According to the revision of the genus *Calycopsis* carried out by Bigelow (1913, 1918, 1940), the present specimens must be referred to *C. bigelowi*, and as a matter of fact they agree quite well with the description and figure given by Vanhöffen of this medusa, which was taken in the Gulf of Aden. In spite of the very considerable geographical range, I am convinced that they belong to the same species. At any rate, they are quite different from *C. borchgrevinki*. They vary in diameter from 7 mm. to 16 mm. (Vanhöffen's specimen was 13 mm. wide), the gonads are similar in structure to *C. bigelowi*. A specimen 9 mm. in diameter has about 32 tentacles; the largest specimen, 16 mm. high and wide, has about 48 tentacles of different sizes, some of them quite small; thus, in this respect also, the specimens agree with Vanhöffen's statements. I may add that the jelly is remarkably soft and adhesive, more or less covered by adhering particles of dirt. In all the specimens the gonads have a characteristic yellow-green colour. In some of the specimens, several peculiar projecting lobes are seen between the folds of the gonads, exactly like those observed in *C. typa* by Bigelow (1909, p. 208, *Sibogita nuarchus*); he was able to state after cutting sections that 'such lobes are nothing more than regions of the sexual organ which have made an irregular growth outwards'.

Distribution. Previously recorded from the Gulf of Aden, 13° 02·8′ N, 46° 41·6′ E, in deep water. Now taken west of Cape of Good Hope, also in deep and intermediate water-layers.



Text-fig. 4. Distribution of: *Calycopsis borchgrevinki* = ●, previous records = ○.
C. bigelowi = ▲. *Russellia mirabilis* = ×.

Bythotiara murrayi Günther 1903

1903 *Bythotiara murrayi* Günther, p. 424. Pl. 10, figs. 4, 5.
1953 *Bythotiara murrayi* Russell, p. 215. Pl. 13, fig. 1. Text-figs. 113A, B; 114A, B; 115, 116.

Occurrence: St. 81. 18. vi. 26. 32° 45′ S, 08° 47′ W. North-east of Tristan da Cunha. Net: N 450 B 650(–0) m. 1 specimen, 17 mm. wide.

St. 1606. 31. x. 35. 26° 15′ 48″ S, 12° 18′ E. Off Ichabo Island, South-West Africa. Net: TYFB 190–0 m. 1 specimen, 26 mm. wide, 21 mm. high.

Distribution. Mediterranean. North-East Atlantic as far north as Norway. West coast of Africa off the mouth of the Congo River. Mainly found in deep and intermediate water-layers. Moreover, a specimen taken near Nias Island in the Indian Ocean was referred to this species by Vanhöffen (1911, p. 213, text-fig. 9).

Heterotiara minor Vanhöffen 1911

1911 *Heterotiara minor* Vanhöffen, p. 212. Pl. 22, fig. 5. Text-fig. 8.
1916 *Heterotiara minor* Browne, p. 183.
1919 *Heterotiara minor* Bigelow, p. 287. Pl. 39, fig. 9; Pl 40, figs. 2–4.
1928 *Heterotiara minor* Kramp, p. 58. Text-figs. 27–30.
1953 *Heterotiara minor* Kramp, p. 268.

Occurrence: St. 1371. 19. v. 34. 36° 42′ 24″ S, 36° 04′ 24″ E. Net: N 100 B 146–0 m. 2 specimens.
St. 1374. 24. v. 34. 31° 46′ 36″ S, 29° 46′ 18″ E. Net: TYFB 230–0 m. 2 specimens.

The localities are off the south-east coast of Africa.

The specimens have the following numbers of tentacles:

Diam. (mm.)	7	9	12	14
No. of tentacles	14	17	19	20

These specimens must therefore be referred to *H. minor* and not to *H. anonyma*, which is a larger medusa with a smaller number of tentacles.

Distribution. Widely distributed in the Indian Ocean and the tropical West Pacific. Not previously found farther west than the Chagos Islands, about 72° E.

Family Russellidae fam.nov.

Anthomedusae with unbranched oral tentacles without terminal cluster of nematocysts, situated above the mouth opening; mouth with simple perradial lips; with groups of hollow, marginal tentacles without basal swellings, partly sunk into narrow fissures of the umbrella margin; with adaxial ocelli.

Russellia gen.n.

Russellidae with an apical projection; with cruciform stomach mounted upon a peduncle; with four pointed oral tentacles; with eight smooth, adradial gonads; with four simple radial canals; with eight groups of marginal tentacles (each group with one large and two small tentacles, the basal part of the large tentacles sunk into a deep furrow of the umbrella margin); with an adaxial ocellus at the base of the free portion of each large tentacle.

Type-species: *Russellia mirabilis* gen.n., sp.n.

The species, which will be described below, is very peculiar and cannot be included in any of the known families of Anthomedusae. It resembles the Calycopsidae in the structure of the basal part of the marginal tentacles, which are of the same type as in *Calycopsis* and *Heterotiara*. In the cross-shaped base of the stomach and the quadrangular mouth it is likewise in accordance with the Calycopsidae and the Pandeidae, and I think that it must be placed in the neighbourhood of these

families. It differs, however, from the Calycopsidae in the possession of a gelatinous apical projection, a well-developed gastric peduncle, four finger-shaped oral tentacles, a pair of small marginal tentacles adjacent to each of the large tentacles, and the presence of an ocellus on each of these latter. Unfortunately the distal parts of the tentacles are missing in all the specimens, so that we do not know whether they have a terminal knob of nematocysts as in the Calycopsidae. In spite of the presence of oral tentacles above the mouth and the grouping of the marginal tentacles, *Russellia* is widely separated from the Bougainvilliidae, in which the corresponding organs have an entirely different structure, and these same features separate it also from any other family of Anthomedusae.

I have great pleasure in naming this genus in honour of the author of many papers on medusae, my friend F. S. Russell.

Russellia mirabilis gen.n., sp.n.

(Plate IV, figs. 1–6, text-fig. 4)

Occurrence: WS 300. 5. x. 28. 55° 07′ 30″ S, 31° 56′ 55″ W. Between South Georgia and South Sandwich Islands. Net: N 100 B 100–0 m. 1 specimen.

St. 584. 13. i. 31. 67° 26′ 45″ S, 69° 35′ 15″ W. West of Graham Land. Net: N 100 B 165–0 m. 1 specimen.

St. 587. 13. i. 31. 66° 28′ 30″ S, 71° 16′ 15″ W. West of Graham Land. Net: N 100 B 400–120 m. 1 specimen.

St. 1871. 12. xi. 36. 64° 04′ 24″ S, 52° 57′ 30″ W. East of South Shetland Islands. Net: TYFB 1450–1000 m. 1 specimen.

The specimen from St. 587 is chosen as the *holotype*.

The umbrella (Pl. IV, fig. 1) is 9 mm. in diameter and about 15 mm. in height, of which the broad, dome-shaped apical projection occupies about one-third. Lateral walls moderately thick, the lower margin hanging in lobes somewhat below the level of the ring-canal. The stomach is mounted on a broad, conical peduncle, about 2 mm. in length, which extends partly into the cavity of the stomach. The base of the stomach is cross-shaped; the stomach itself is deeply folded inward in the interradii, and in one of the specimens also in the perradii. In the preserved condition the stomach is slightly wider than long, its length somewhat less than half the height of the bell cavity. The interior surface of the stomach is densely wrinkled transversally, and along each interradius is a narrow, prominent ridge thrown into regular transverse folds (Pl. IV, fig. 2), indicating that in living specimens the stomach may be extended to a greater length. The gonads are adradial, separated in the perradii and interradii by narrow lines. They occupy the entire length of the stomach, and their surface is smooth, without transverse folds.

The mouth tube is very short, the mouth quadrangular with very short and simple perradial lips. The mouth rim is smooth and entire, slightly thickened (Pl. IV, fig. 3); there are no nematocysts in the rim itself, but some few are scattered in the wall above it. At a short distance above the perradial corners of the mouth are four oral tentacles (Pl. IV, fig. 3), finger-shaped, tapering towards their distal end; they have no terminal cluster of nematocysts, but numerous nematocysts are evenly scattered throughout the entire length of the tentacle, no more densely towards the tip than in the basal part.

There are four radial canals. Their ascending part, on the peduncle, is fairly wide, in transverse section like an equilateral triangle; the descending portion on the subumbrella is narrow and flat, with smooth edges. Ring-canal narrow. Velum narrow.

There are eight large tentacles, four perradial and four interradial, of equal size (Pl. IV, figs. 4–6). The basal part of each tentacle, the 'root', is directed upward and outward and is deeply sunk into a narrow fissure between two prominent lobes of the umbrella-margin. In the interradial tentacles the ascending root is directly adnate to the gelatinous tissue of the exumbrella, in the perradial tentacles the root is connected with the terminal part of the corresponding radial canal by a triangular split. The free, filiform parts of the tentacles are only seen in one of the specimens (St. 584); they are very

thin, hollow, up to 5 mm. long, but apparently all of them have lost their terminal portions; it cannot be stated, therefore, whether they have had a terminal knob of nematocysts. Immediately below the point of issue of the filiform tentacles is a red ocellus.

At the base of each of the eight large tentacle roots is a pair of similar tentacular structures, much smaller and diverging on both sides of the large one (Pl. IV, figs. 4–6). Apparently, therefore, this medusa has not merely eight single tentacles, but eight clusters, each consisting of one large and two small tentacles.

The four specimens have the following dimensions:

St. WS 300, diam. 7·5 mm., height 13 mm., male.
St. 584, diam. 7·5 mm., height 12 mm., female.
St. 587, diam. 9 mm., height 14 mm., female (the type specimen).
St. 1871, diam. 9 mm., height 15 mm., male.

The localities where this interesting species was collected are all within the antarctic region. Three of the hauls were made in the upper layers, but at St. 1871, east of South Shetland Islands, the medusa was apparently taken in deep water. If the bathymetric details are correct, this may perhaps be explained by the downward movement of the antarctic surface water in this region.

(Since the above was written, I have seen some specimens of the same species collected by the 'Dana' in West-Indian waters.)

Family Tiarannidae

Tiaranna rotunda (Quoy & Gaimard 1824)

(Text-fig. 5)

1910 *Tiara rotunda* Mayer, p. 124.
1913 *Tiaranna rotunda* Hartlaub, p. 266. Text-figs. 218, 219.
1920 *Tiaranna rotunda* Kramp, p. 6. Pl. 1, figs. 2–4.

Occurrence: St. 71. 30. v. 26. 43° 20′ S, 46° 02′ W. Off Patagonia. Net: N 70 V, 1000–750 m. 1 specimen.
St. 276. 5. viii. 27. 05° 54′ S, 11° 19′ E. Gulf of Guinea. Net: TYF 150(–0) m. Fragments of two specimens.
St. 1702. 17. iii. 36. 64° 20′ 06″ S, 139° 54′ E. Off Wilkes Land, Antarctica. Net: TYFB 2000–1250 m. 1 specimen.
St. 1723. 28. iii. 36. 60° 06′ 42″ S, 102° 48′ 36″ E. Off Queen Mary Land, Antarctica. Net: TYFB 800–500 m. Fragments of two specimens.

All the specimens are in a very poor condition, but I am so well acquainted with this species that the identification is beyond doubt.

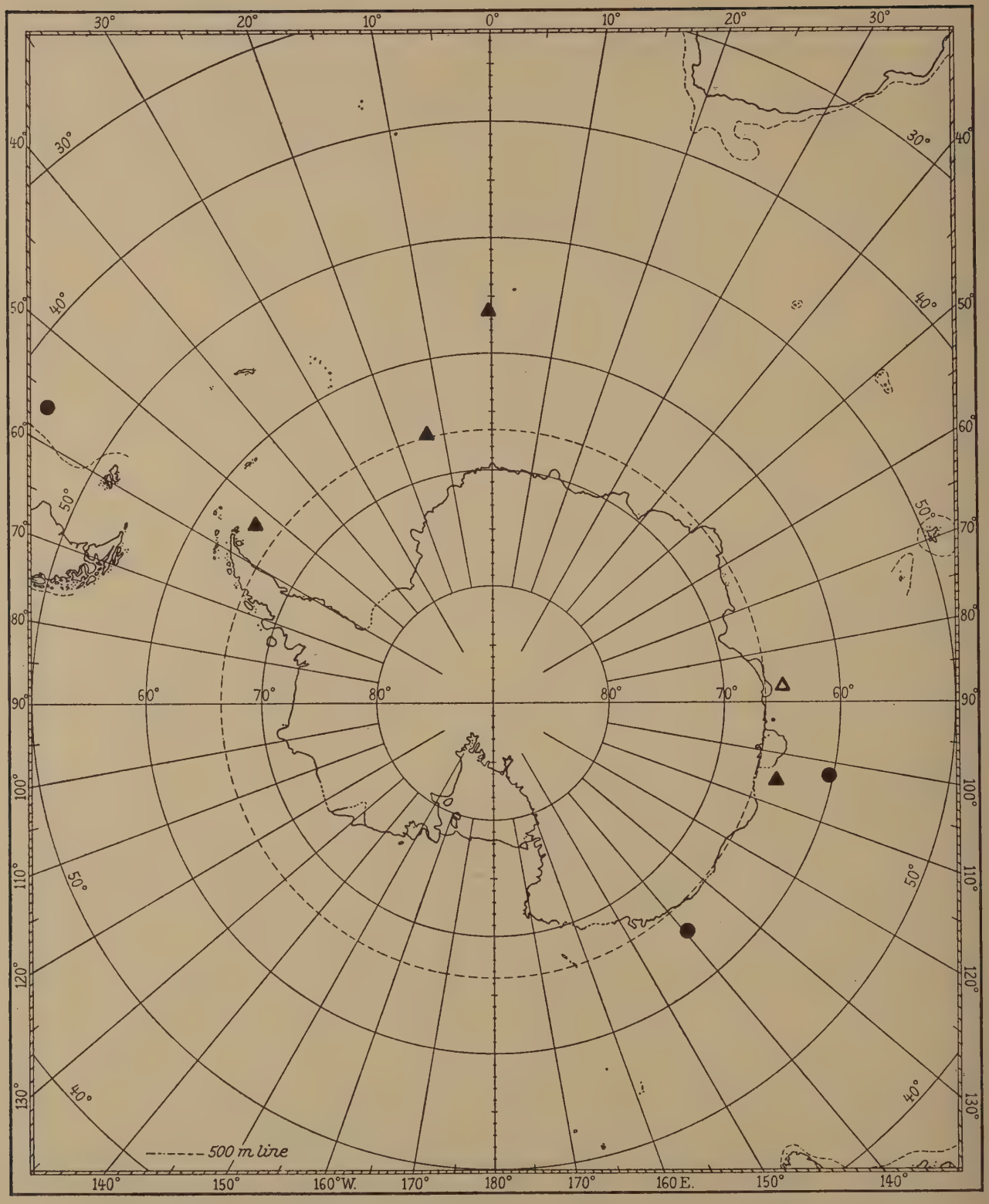
Distribution. This species belongs to the deep and intermediate layers; it has been recorded from several localities in the North Atlantic and the western part of the Mediterranean. It might be expected to have a wider distribution, and the above records show that this is so, the area being extended to include the South Atlantic and the antarctic seas to the south of Australia.

Chromatonema rubrum Fewkes 1882

(Text-fig. 5)

1882 *Chromatonema rubrum* Fewkes, p. 305. Pl. 1, fig. 41.
1910 *Thaumantias rubrum* Mayer, p. 199.
1919 *Chromatonema rubrum* Kramp, p. 7. Pl. 1, figs. 1–8. Text-figs. 3, 4*a*.
1947 *Chromatonema rubrum* Kramp, p. 52. Pl. 6, fig. 7 (coloured drawing from life).

Occurrence: St. 101. 15. x. 26. 33° 50′ S, 16° 04′ E to 34° 13′ S, 15° 49′ E. West of Cape of Good Hope. Net: N 450 850–950 m. 1 specimen.
St. 1719. 25. iii. 36. 64° 15′ 30″ S, 104° 03′ 24″ E. Off Knox Land, Antarctica. Net: TYFB 950–550 m. 1 specimen.



Text-fig. 5. Distribution in the antarctic and adjacent seas of: *Tiaranna rotunda* = ●. *Chromatonema rubrum* = ▲, previous records = △.

St. 1780. 2. vi. 36. 56° 10′ 06″ S, 00° 08′ 48″ W. South-west of Bouvet Island. Net: N 70 B 700–450 m. 1 specimen.
St. 1871. 12. xi. 36. 64° 04′ 24″ S, 52° 57′ 30″ W. East of Joinville Island, Graham Land. Net: TYFB 1450–1000 m. 1 specimen.
St. 2006. 19. iii. 37. 66° 16′ 42″ S, 13° 23′ 18″ W. Off Coats Land, Antarctica. Net: TYFB 1750–1400 m. 1 specimen.

The specimens are about 15–20 mm. in diameter, more or less damaged.

Distribution. This bathypelagic medusa has been found in several localities in the North Atlantic, as far north as the Davis Strait, west of Greenland. It has also been recorded from the neighbourhood of the Bermudas and the Azores. Two other species of *Chromatonema* have been described, *C. erythrogonon* (Bigelow 1909) and *C. hertwigi* (Vanhöffen 1911); the first was found in the tropical east Pacific, the other in the Indian Ocean between Ceylon and the Nicobar Islands. Both of them are probably identical with *C. rubrum*. Moreover, it seems very likely to me that *Ptychogena aurea* Vanhöffen (1912*a*, p. 366. Pl. 24, fig. 4) belongs to *C. rubrum*. His description, though insufficient, does not contradict this supposition, and the coloured figure shows a considerable resemblance to the specimens collected by 'Discovery II' in other parts of the antarctic seas. Vanhöffen's medusa was found north-west of the Gauss station, and up to now it has been regarded as a doubtful species. The Discovery collections show that *C. rubrum* is widely distributed in the deep sea around half the circumference of the Antarctic Ocean.

LEPTOMEDUSAE

Family Laodiceidae

Laodicea undulata (Forbes & Goodsir 1851)

1953 *Laodicea undulata* Russell, p. 230. Pl. 14, figs. 1–3. Text-figs. 123–31.

A survey of the history and nomenclature of this species is given by Russell in the monograph referred to above.

Occurrence: St. 100 C. 1. x. 26. 33° 20′ S, 15° 18′ E to 33° 46′ S, 15° 08′ E. South-west of Cape of Good Hope. Net: TYF 0–5 m. 2 specimens.
St. 708. 23. x. 31. 10° 20′ 36″ S, 34° 54′ 42″ W. Off Aracaju, Brazil. Net: TYFB 208–0 m. 2 specimens.

The specimens from St. 708 are young stages, about 3 mm. wide; one of the specimens from St. 100 C is 11 mm., the other 31 mm. in diameter. They are typical in every respect, and the occurrence in these two localities confirms the supposition that all forms of *Laodicea* found in the Atlantic area (except *L. pulchra*, see below) belong to *L. undulata*. It has been recorded only once before from the southern Atlantic, namely, from the Patagonian Bank (Thiel 1938*b*, p. 322). Moreover, I have seen numerous specimens taken in the Gulf of Guinea (Kramp 1955, p. 253).

Distribution. Widely distributed in the North Atlantic and the Mediterranean. On the Atlantic coast of America it occurs from the Gulf of Maine to the West Indies, and its American distribution is now augmented southward to the Brazilian coast, besides the record from Patagonia mentioned above. On the European coasts, it occurs from Iceland to Portugal, and on the west coast of Africa it has been recorded from the Cape Verde Islands and the Gulf of Guinea, and now has also been taken near the Cape of Good Hope.

Laodicea pulchra Browne 1902

(Pl. IV, fig. 7)

1902 *Laodicea pulchra* Browne, p. 280.
1939 *Laodicea pulchra* Browne & Kramp, p. 291. Pl. 16, figs. 3–5.

Occurrence: St. 719. 13. xi. 31. 54° 00′ S, 60° 00′ W. South of Falkland Islands. Net: N 100 B 109–0 m. 1 specimen, young stage.

St. 1897. 27. xi. 36. 49° 55′ S, 63° 09′ 24″ W. North-west of Falkland Islands. Net: N 100 B 151–0 m. 2 specimens.

St. WS 832. 1. xi. 32. 50° 49′ S, 67° 55′ W. Near the coast of southern Patagonia. Net: N 100 B 75–0 m. 2 specimens.

This species was briefly described by Browne in 1902, and its identity was more or less doubted until 1939, when a more thorough description was given and the drawings, previously made by Browne, were reproduced. There is no doubt now that *L. pulchra* is a distinct species. The original collection contained five specimens from the Falkland Islands, and no more have been found up to now. According to a note on the label of St. 1897, this species was a 'common form in this line of stations'; it is deplorable, therefore, that so few specimens were preserved.

The smallest specimen in the original collection was 6 mm. wide and had 17 tentacles. The specimen from St. 719 is in a still younger stage, being 2 mm. wide and 2·5 mm. high; the radial extensions of the stomach are short, but in their lateral walls the gonads are beginning to appear as tiny folds. There are four fully developed perradial tentacles, spirally coiled, and four interradial bulbs which are thick and conical with a small pointed tip. Three cordyli are present between each successive pair of tentacles and bulbs, each of them mounted on a small bulb, the median one somewhat larger than the others. An ocellus is seen on the adaxial side of the tentacular bulbs as well as on the bulb of the median cordylus in each group.

The other specimens are 15–19 mm. in diameter, but it should be remarked that in the specimens from Station 1897 the umbrella margin is much contracted, so that the diameter is only slightly larger than the height of the umbrella. In the preserved condition the specimens have the following dimensions:

Station	WS 832		1897	
Diam. (mm.)	15	19	15	17
Height (mm.)	7	8	11	14
No. of tentacles	38	34	46	52

The radial lobes of the stomach are not quite as long as in the type specimen, reaching along slightly more than the proximal half of the gonads. The transverse folds of the gonads (Pl. IV, fig. 7) are strongly developed and very regular, slowly decreasing in width from the proximal to the distal end of the gonad. The terminal ends of the radial canals between the gonads and the ring-canal are very short. The marginal organs agree with the original description except that the cordyli are less distinctly club-shaped, evenly increasing in width towards their distal end, and, in contradistinction to the statement in the earlier description, they are provided with numerous nematocysts in their outermost parts.

Distribution. This species has only been found in the immediate neighbourhood of the Falkland Islands, and between these islands and the coast of Patagonia.

Ptychogena antarctica Browne 1910

(Pl. IV, fig. 8)

1910 *Ptychogena antarctica* Browne, p. 29. Pl. 2, figs. 6–9.

1912*a* *Ptychogena antarctica* Vanhöffen, p. 365.

Occurrence: St. 1959. 8. ii. 37. Scotia Bay Landing, South Orkney Islands. Found floating on surface very close to the shore. 1 fragmentary specimen.

The few specimens of this medusa observed up to now have all been in a bad and mutilated condition. Browne examined three specimens from Cape Adare and one from McMurdo Sound, and if the identification is correct, Vanhöffen saw a fifth fragmentary specimen from the Gauss Station. The

Discovery specimen has also fallen into several pieces, but some of the isolated parts are in good condition. The gelatinous substance is very thick. Only a small, densely folded piece of the stomach is retained. The gonads (male) are well preserved; each of them is about 28 mm. long and 8 mm. broad, a funnel-shaped prolongation from the stomach encloses their lower surface almost throughout their entire length. The gonads are complexly folded; they have about 15 primary pockets on each side, each of them further divided into two to four or five lamellar folds. The median line, by which the radial canal with the gonads is attached to the subumbrella, is irregularly zigzag, and the lateral diverticula are not attached to the subumbrella. The distance from the gonad to the ring-canal is 12 mm.

The tentacle bulbs are elongated, somewhat laterally compressed, convex on the abaxial side, and very close together. Only a few cordyli are retained, but in one place it can be seen that they alternate with the tentacles. They are club-shaped, but the pedicel is not very thin, exactly as in Browne's figure; their central cavity is very narrow.

If we presume that the stomach has been about 20 mm. wide, the diameter of the entire specimen was probably about 100 mm.

According to a note on the label, the colour of the gonads was 'a very pale dull (or dirty) white pink'.

The description given by Vanhöffen indicates that the Gauss specimen really belonged to this same species, though he stated that the stomach, gonads and tentacles of the living specimen had a dark coffee-brown colour.

Distribution. Cape Adare and McMurdo Sound, Victoria Land (Browne); Gauss Station (Vanhöffen). The locality, where the present specimen was taken, off the South Orkney Islands, is on the opposite side of the Antarctic Continent.

Staurophora mertensi Brandt 1838

1908 *Staurophora falklandica* Browne, p. 235. Pl. 1, figs. 1–7.
1919 *Staurophora mertensii* Kramp, p. 39. Pl. 1, fig. 9; Pl. 2, figs. 9–10; Pl. 3, fig. 7. History and synonymy.
1953 *Staurophora mertensi* Russell, p. 239. Text-figs. 132–7.

Occurrence: St. 60. 21. v. 26. 50° 45′ S, 56° 33′ W. Net: N 100 H 75(–0) m. Fragments.
St. 1895. 26. xi. 36. 49° 55′ 12″ S, 60° 59′ 06″ W. Net: N 100 H 0–5 m. 5 specimens.
St. 1896. 7. xi. 36. 49° 55′ 06″ S, 62° 05′ W. Net: N 70 V 140–100 m. Fragments of 2 specimens.
St. 1897. 27. xi. 36. 49° 55′ S, 63° 09′ 24″ W. Net: N 100 B 151–0 m. 5 specimens. 'Common form on this line of stations.'
St. 1959. 8. ii. 37. Scotia Bay Landing, South Orkney Islands. Shore coll., 0 m. 1 specimen.
St. WS 73. 6. iii. 27. 51° 01′ S, 58° 54′ W. Net: N7–T 121–130 m. 70 specimens and numerous fragments.
St. WS 207. 28. iv. 28. 54° 12′ S, 58° 40′ W. Net: N 100 B 75–0 m. 3 specimens.
St. WS 865. 29. iii. 32. 50° 03′ S, 64° 14′ W. Net: NR 126(–0) m. 5 specimens.

With the exception of St. 1959 all these localities are in the surroundings of the Falkland Islands.

Some of the specimens are very large, but most of them are in a fragmentary condition. The specimens collected in November (Stns 1895–7) are 34–60 mm. in diameter; the numerous specimens from St. WS 73, 6 March, vary between 30 and 80 mm., those collected between 29 March and 28 April (Stns WS 207 and WS 865) are 100–120 mm. wide. Unfortunately, the only specimens collected in May (St. 60) cannot be measured.

It is now possible to state with certainty that *Staurophora falklandica* Browne is identical with *S. mertensi*. The description of *S. falklandica* was based on one specimen, and Browne himself pointed out its strong resemblance to the North Atlantic species, from which it was distinguished only by the considerable difference in size between the large and the small tentacles, which alternated almost regularly. An examination of numerous specimens from the northern Atlantic enabled me to

state (Kramp 1919) that the same arrangement was frequently found in the northern form, and now that a large collection of the southern form has become available, I can confirm that in this respect both forms are subject to the same variations. *S. falklandica* has never been observed again since it was described by Browne until now, and in the literature it has usually been mentioned as a doubtful synonym of *S. mertensi*. The Discovery collection has enabled me to compare the two forms side by side, and I have found that they agree in every respect. Unfortunately, very few of the southern specimens are in such a condition that the tentacles can be counted; in four specimens the numbers are as follows:

Diam. (mm.)	34	54	64	115
Approx. no. of tentacles	300	400	700	1400

In this respect also, the Falkland specimens agree with the North Atlantic form.

Staurophora mertensi is thus the only existing species of the genus.

Distribution. Arctic-boreal, circumpolar. In the North Pacific it occurs as far south as Akkeshi Bay in northern Japan and Sitka on the south coast of Alaska. In the North Atlantic area it is common from West Greenland to Cape Cod and is occasionally found at Woods Hole. In the eastern part of the North Atlantic it is common round Iceland and along the northern part of the west coast of Norway, occasionally, but not regularly, occurring in the North Sea. Its occurrence in the surroundings of the Falkland Islands and the South Orkney Islands shows that it is a bipolar species.

Family Mitrocomidae

Mitrocomella frigida (Browne 1910)

1910 *Cosmetira frigida* Browne, p. 35.
1912*a* *Cosmetira frigida* Vanhöffen, p. 367. Text-fig. 3.
1932 *Mitrocomella frigida* Kramp, p. 345. Pl. 10, figs. 5–6. Text-figs. 23.

Occurrence: St. 256. 23. vi. 27. 35° 14′ S, 6° 49′ E. West of Cape of Good Hope. Net: TYF 850–1100(–0) m. 1 specimen. Stns MS 23, MS 26, MS 34, 12. iv, 14. iv and 2. v. 1925. East Cumberland Bay, South Georgia. 1 or 2 specimens on each occasion.

All the specimens are in a poor condition. The description given by me (1932) was based on Browne's original specimens, in the British Museum (Nat. Hist.), London. The number of statocysts then remained uncertain, and in the present specimens from South Georgia their number cannot be counted; but in some other specimens from South Georgia, collected by the Swedish Antarctic Expedition (Kramp 1948*b*, p. 4), I was able to state that the number is eight. The specimen from St. 256 also has eight statocysts.

Distribution. McMurdo Bay, Victoria Land (Browne); Gauss Station (Vanhöffen); South Georgia (Kramp 1948*b* and the present collection). It is interesting that this antarctic species was also taken at a considerable distance west of the Cape of Good Hope, evidently under the cooling influence of the Benguela Current. The specimen was probably taken in the upper layers (as the net failed to close) where the temperature of the water is given as 17·2° C.

Halopsis ocellata A. Agassiz 1865

1865 *Halopsis ocellata* A. Agassiz, p. 99. Figs. 143–7.
1919 *Halopsis ocellata* Kramp, p. 65. Pl. 4, figs. 1–5. Text-figs. 6–9.
1932 *Halopsis ocellata* Kramp, p. 353. Figs. 6, 12, 19, 28, 32, 43.
1953 *Halopsis ocellata* Russell, p. 273. Pl. 14, fig. 4. Text-figs. 162–6.

Occurrence: St. WS 851. 11. ii. 32. 51° 39′ S, 62° 02′ 30″ W. to 51° 41′ S, 62° 00′ W. West of the Falkland Islands. Net: N4–T, 221–198 m. 1 specimen.

The occurrence of this North Atlantic medusa near the Falkland Islands is most astonishing. The specimen is, however, typical in every respect, and it is impossible to point out any structure which might justify the erection of a new species distinct from *H. ocellata*. It is 31 mm. in diameter and has 12 radial canals in four groups of three each. Parts of the umbrella margin are mutilated, but from countings in well-preserved portions the number of tentacles may be estimated at about 100, the number of marginal vesicles as between 70 and 80; there is one cirrus between each successive pair of tentacles. Thus also in numerical respects this specimen agrees with the North Atlantic form.

DISTRIBUTION. East coast of North America, north of Cape Cod; west coast of Greenland as far north as Disko Bay; southern and western coasts of Iceland; west of the British Isles; the Faeroes; west coast of Norway from Bergen to Tromsö. In the North Atlantic area this species accordingly may be designated as northern-boreal. The present find in anti-boreal waters shows that it has a bipolar distribution.

Cosmetirella davisi (Browne 1902)

(Text-fig. 6)

1902 *Tiaropsis davisi* Browne, p. 281.
1910 *Cosmetirella simplex* Browne, p. 34. Pl. 1, figs. 6–8.
1911 *Phialella falklandica* Vanhöffen, p. 223. Pl. 22, fig. 10.
1912*a* *Cosmetirella kerguelensis* + *simplex* Vanhöffen, p. 368.
1920 *Cosmetirella simplex* Vanhöffen, p. 16.
1932 *Cosmetirella davisi* Kramp, p. 359. Text-figs. 4, 34, 46.
1938*b* *Cosmetirella davisi* Thiel, p. 327.
1939 *Cosmetirella davisi* Browne & Kramp, p. 293. Pl. 17, fig. 1.
1949 *Cosmetirella davisi* Kramp, p. 3.

OCCURRENCE: Stns 29, 30, 41B, 102, 308, 309, 314, 315, 316, 317, 326, 328, 339, 347, 348, 349, 350, 356, 592, 1719. St. WS 832. Stns MS 1, 2, 7, 9, 11, 19, 20, 22, 23, 26, 32, 62, 65. (For details, see Table 1.)

All these localities are in the neighbourhood of South Georgia, with the exception of the following:

St. 102. 28. x. 26. 35° 29′ 20″ S, 18° 33′ 40″ E. South of Cape of Good Hope. Net: N 100 H 52 m. 1 specimen.
St. 592. 15. i. 31. 64° 17′ S, 75° 31′ W. West of Graham Land. Net: N 100 B 124–0 m. 1 specimen.
St. 1719. 25. iii. 36. 64° 15·5′ S, 104° 03·4′ E. Off Knox Land, Antarctica. Net: N 100 B 128–0 m. 1 specimen.
St. WS 832. 1. ii. 32. 50° 49′ S, 67° 55′ W. Near the coast of southern Patagonia. Net: N 100 B 75–0 m. 1 specimen.

Altogether about 100 specimens of this species were preserved.

As previously pointed out by me (Kramp 1932), the number of tentacles is very variable in this species. Countings of the tentacles in the present collection have given the following results:

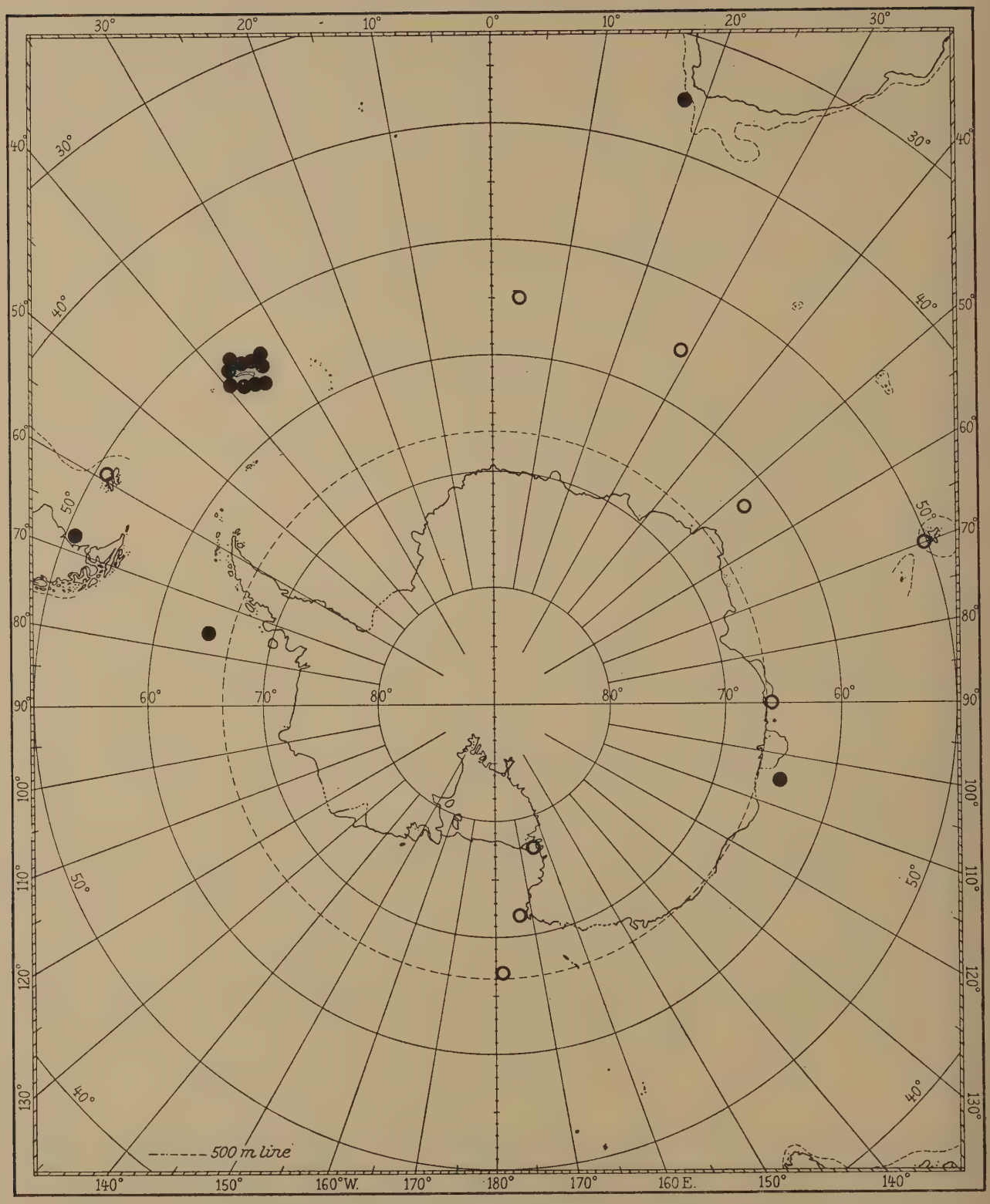
Diam. (mm.)	8–10	10–15	15–20	20–25	25–30	30–35	35–40	50	60
No. of tentacles	42–92	40–92	82–110	140	132–156	152–164	156–172	182	180

Almost all the specimens were collected between January and April, a single one in November, and some fragments in May. Within each of these months the specimens had the following diameters:

Month	Nov.	Jan.	Feb.	Mar.	April
Diam. (mm.)	16	11–35	8–39	11–60	11–20

The specimen taken south of the Cape of Good Hope (St. 102) was 35 mm. in diameter.

DISTRIBUTION. Antarctic and subantarctic, circumpolar (see map of distribution in Kramp 1949). The present record from near the coast of South Africa is not quite isolated, since the species was recorded by Vanhöffen (1920) from a locality off the coast of South-West Africa.



Text-fig. 6. Distribution of *Cosmetirella davisi* = ●, previous records = ○.

Family CAMPANULARIIDAE

Phialidium simplex Browne 1902

1902 *Phialidium simplex* Browne, p. 282.
1939 *Phialidium simplex* Browne & Kramp, p. 299. Pl. 17, figs. 5–9.
1953 *Phialidium simplex* Kramp, p. 272.

OCCURRENCE: St. 1375. 25. v. 34. 34° 30·8′ S, 26° 19′ E. Off the south coast of Africa. Net: TYFB 210–0 m. 1 specimen, 12 mm. in diameter with about 48 tentacles.

DISTRIBUTION. Falkland Islands; southern part of the coast of Brazil; north-east coast of Australia.

Phialidium discoidum (Mayer 1900)

1900 *Oceania discoida* Mayer, p. 51. Pl. 20, figs. 53–55.
1910 *Phialidium discoidum* Mayer, p. 272. Pl. 33, figs. 9–11.

OCCURRENCE: St. 708. 23. x. 31. 10° 20′ 36″ S, 34° 54′ 42″ W. Off Aracaju, Brazil. Net: TYFB 208–0 m. 5 specimens.

The specimens are almost hemispherical, 3·5–4 mm. in diameter, with 16 tentacles. The stomach is small with somewhat bulging sides; mouth with four simple lips, slightly folded. Two of the specimens have well-developed gonads, one male, and one female with very large eggs; the gonads are thick and cylindrical along the distal one-third to one-half of the radial canals. The 16 tentacles are of about equal size, with short and broad, almost globular basal bulbs. Two or three statocysts between successive tentacles.

These specimens agree so well with Mayer's description and figures of specimens from Tortugas, Florida, that it seems to me very probable that they belong to the same species. On the other hand, all records of this species from the Pacific seem to me very doubtful. It is recorded from several localities in Japan by Maas (1909, p. 25) and Uchida (1925, p. 90; 1927*b*, p. 221; 1938, p. 42) and also from the central Pacific (Uchida 1947*a*, p. 304, text-fig. 6), and from the Pacific coast of Mexico by Bigelow (1909, p. 155. Pl. 6, fig. 8; Pl. 38, figs. 6–7). All these medusae are of larger size and have up to 36 tentacles, and as a rule there is only one statocyst between the tentacles. Bigelow compared his Mexican specimens with specimens from the West Indies, with up to 46 tentacles, and found them indistinguishable from each other. He may be right that they belong to one and the same species, but I am sure that none of them belong to *P. discoidum* Mayer, which is a small medusa, only 4 mm. wide, with 16 tentacles and usually 3 statocysts between the tentacles. Bigelow is inclined to think that the difference between his specimens and Mayer's was due to the latter being young stages; but according to Mayer's description and figures their gonads were particularly well developed and contained very large eggs, and the same applies to the Brazilian specimens in the Discovery collection.

Another question arises, namely, whether *P. discoidum* is a valid species. The summer form of *P. hemisphaericum* from North European waters frequently attains a very similar appearance, being mature at a stage with 16 tentacles and then usually with two, sometimes three, statocysts between the tentacles. As a rule, however, its gonads are short and oval and not elongated as in *P. discoidum*.

DISTRIBUTION. Florida; northern part of the east coast of Brazil.

Obelia sp.

OCCURRENCE: St. 91. 8. ix. 26. False Bay, South Africa. Net: TYF 0–5 m. 3 specimens, *c.* 3 mm. in diameter.

Family Lovenellidae

Eucheilota sp.

(Pl. V, fig. 1)

Occurrence: St. 91. 8. ix. 26. False Bay, South Africa. Net: TYF 0–5 m. 1 specimen.

I am not inclined to establish a new species for this single specimen, though it does not agree with any of the 14 species of *Eucheilota* described up to now. While on the Danish 'Galathea' Expedition, in the Indian Ocean and western Pacific I saw many medusae belonging to this genus, apparently representing several different species, some of which could not be referred to any known species. A thorough revision is needed before a reliable limitation of these numerous forms can be carried through. Provisionally, therefore, I shall only give a short description and a figure of the little medusa taken in False Bay by R.R.S. 'Discovery'.

The umbrella is almost hemispherical, 2 mm. wide and 1 mm. high, with very thin walls. Manubrium narrow, mouth with an indication of four simple lips. Gonads (male) egg-shaped, about one-third as long as the radial canals, situated a little outside the middle of the canals; one of the gonads is undeveloped. Radial canals and ring-canal very narrow. Velum narrow. There are two well-developed perradial tentacles with broadly conical basal bulbs, and two globular perradial bulbs without tentacles; moreover, four small interradial bulbs and a few very tiny marginal swellings. Eight fairly large adradial marginal vesicles. In each octant about five marginal cirri, typically spiral with a solid endoderm and a terminal knob containing nematocysts. There is no black pigmentation anywhere, neither on the stomach nor on the marginal bulbs.

Family Phialellidae

Phialella falklandica Browne 1902

1902 *Phialella falklandica* Browne, p. 282.
1909 *Phialella* sp. Benham, p. 307. Pl. 12, figs. 3–6.
1910 *Eucope falklandica* Mayer, p. 237.
1912*b* *Phialella falklandica* Vanhöffen, p. 21.
1939 *Phialella falklandica* Browne & Kramp, p. 296. Pl. 17, figs. 2–4; Pl. 19, figs. 3–5. Text-fig. 1.
1911 non *Phialella falklandica* Vanhöffen, p. 223. Pl. 22, fig. 10.

Occurrence: St. 58. 19. v. 26. Port Stanley, East Falkland Island. Net: N 70 H 5–0 m. 37 specimens, diam. 4–10 mm.

St. 719. 13. xi. 31. 54° 00′ S, 60° 00′ W. South of Falkland Islands. Net: N 100 B 109–0 m. 6 specimens, diam. 1–3 mm.

St. WS 832. 1. ii. 32. 50° 49′ S, 67° 55′ W. Off the coast of southern Patagonia. Net: N 100 B 75–0 m. 1 specimen, diam. 12 mm.

Distribution: Common in the neighbourhood of the Falkland Islands (Browne); recorded from the west coast of South America between the Strait of Magellan and Callao in Peru (Vanhöffen); Auckland and Campbell Islands (Benham).

Family Phialuciidae

Octophialucium medium Kramp 1955

1955 *Octophialucium medium* Kramp, p. 257. Pl. II, fig. 1.

Occurrence: St. 282. 12. vii. 27. 01° 11′ S, 05° 38′ E. Gulf of Guinea. Net: TYF 300(–0) m. 1 specimen.

The specimen is about 30 mm. in diameter, one of the eight radial canals is bifurcated, the tentacles are lost.

The genus *Octophialucium* was recently established by me to comprise a number of species previously referred to *Octocanna* Haeckel, which must be regarded as an altogether doubtful genus. In the same paper I described a new species, *O. medium*, of which numerous well-preserved specimens were collected by the Danish 'Atlantide' Expedition near the coast of Nigeria. The present specimen was taken somewhat farther south in the Gulf of Guinea.

Octophialucium aphrodite (Bigelow 1906)

1906*a* *Octocanna polynema* Maas, p. 95. Pl. 3, fig. 10.
1919 *Octocanna aphrodite* Bigelow, p. 307. Pl. 42, figs. 1–2.
1928 *Octocanna aphrodite* Stiasny, p. 212. Text-fig. 2.
1955 *Octophialucium aphrodite* Kramp, p. 259.

Occurrence: St. 1574. 23. iv. 35. 21° 44′ 36″ S, 40° 33′ 42″ E. Mozambique Channel. Net: TYFB 600–0 m. 1 specimen.

The specimen is 25 mm. in diameter; the eight radial canals are somewhat irregularly placed. Two of the gonads are retained, they are linear, in the distal one-fifth to one-fourth of the radial canals. The tentacle bulbs are broadly conical, provided with an adaxial papilla, but without an abaxial spur. All the tentacles are of equal size, and there are no rudiments between them. As a rule there is only one marginal vesicle between successive tentacles, rarely two, each with two concretions. Most of the tentacles are lost, but in a considerable portion of the umbrella margin all are retained; the total number of tentacles is estimated as between 80 and 100.

Among the five species of *Octophialucium* known up to now, *O. aphrodite* is the only species to which the present specimen may be referred with some degree of probability. In this species some young bulbs are usually present between the fully developed tentacles, but the Discovery specimen is so similar to the one described and figured by Maas from Amboina that their identity seems to me very probable. The absence of young marginal bulbs may be due to the specimen being fully developed. The largest specimen observed by Maas was likewise 25 mm. in diameter, with about 80 tentacles among which new ones *might* be inserted, but none are shown in his figure. One or two species of this genus occur off the coasts of India; they are quite distinct from *O. aphrodite*.

Distribution. Amboina (Maas); Philippines (Bigelow); Java Sea (Stiasny). Now found in the Mozambique Channel between Madagascar and the east coast of Africa.

Family Eirenidae

Phialopsis diegensis Torrey 1909

(Text-fig. 7)

1909 *Phialopsis diegensis* Torrey, p. 23. Fig. 9.
1953 *Phialopsis diegensis* Russell, p. 333. Pl. 20, fig. 5. Text-figs. 213–14.

Occurrence: St. 89. 28. vi. 26. 34° 05′ 15″ S, 16° 00′ 45″ E. Net: TYF 1000(–0) m. 1 specimen.
St. 100. 2. x. 26. 33° 20′ S, 15° 18′ E to 33° 46′ S, 15° 08′ E. Net: TYF 260–310 m. 1 specimen. TYF 475(–0) m. 1 specimen.
St. 256. 23. vi. 27. 35° 14′ S, 6° 49′ E. Net: TYF 850–1100 (–0) m. 1 specimen.
St. 276. 5. viii. 27. 05° 54′ S, 11° 19′ E. Net: TYF 150(–0) m. 14 specimens.
St. 282. 12. viii. 27. 01° 11′ S, 05° 38′ E. Gulf of Guinea. Net: TYF 300(–0) m. 3 specimens.
St. 697. 12. v. 31. 09° 15′ 15″ N, 30° 01′ 45″ W. Net: TYFB 460–0 m. 1 specimen.
St. 698. 13. v. 31. 12° 21′ 45″ N, 30° 07′ 30″ W. Net: TYFB 470–0 m. 1 specimen.
St. 699. 14. v. 31. 14° 27′ 15″ N, 30° 02′ 15″ W. Net: TYFB 370–0 m. 6 specimens.
St. 703. 18. x. 31. 07° 17′ N, 28° 01′ 54″ W. Net: TYFB 358–0 m. 6 specimens.
St. 714. 30. x. 31. 35° 09′ 30″ S, 47° 00′ W. Off Montevideo, Uruguay. Net: TYFB 246–0 m. 4 specimens.
St. 1371. 19. v. 34. 36° 42′ 24″ S, 36° 04′ 24″ E. South-east of South Africa. Net: N 100 B 146–0 m. 1 specimen.

Text-fig. 7. Distribution of *Phialopsis diegensis* = ●, previous records = ○.

St. 1568. 11. iv. 35. 34° 47′ 36″ S, 34° 27′ 54″ E. Net: TYFB 1400–0 m. 4 specimens.
St. 1587. 3. v. 35. 06° 05′ N, 52° 00′ E. Indian Ocean, off Somaliland. Net: TYFB 450–0 m. 1 specimen.
Stns 89, 100, 256 and 1568 are west and south-west of the Cape of Good Hope; stns 697, 698, 699 and 703 are south-west of the Cape Verde Islands.

This is a leptomedusan with a predominantly oceanic distribution, frequently found at considerable distances from the coasts. It is rarely met with in the uppermost water-layers, and the records of the Discovery collections indicate that it belongs mainly to the deeper parts of the epipelagic region. It was collected at very different seasons, April, May, June, August and October. The diameter of the specimens varies between 6 mm. and 20 mm. with no correlation with the seasons.

Distribution. Originally described from San Diego in California (Torrey 1909) and south-west of the Galapagos Islands (Bigelow 1909). Recorded from a few localities in the North Atlantic: Irminger Sea (Maas 1893 as *Irene viridula*), south-west of Ireland (Russell 1940*a* and 1953) and east of the Newfoundland Bank (Kramp 1948*a*). Also taken in several localities in the tropical East Atlantic, as far south as the neighbourhood of Ascension Island (Vanhöffen 1911 and 1912*a*). Some of the localities where it was collected by the 'Discovery' and 'Discovery II' are considerably farther south in the Atlantic, and it has now for the first time been found in the Indian Ocean, off the east coast of Africa.

Family Aequoreidae

Genus **Aequorea**

Besides some specimens which are too young or too mutilated to be identified with certainty, three species of *Aequorea* were collected, and in spite of the frequently emphasized variability of these medusae and the current uncertainty of the delimitation of the numerous species, I am perfectly sure of the identification of these three species. Two specimens of *A. coerulescens* were taken off the Pacific coast of South America. Of the specimens collected in various parts of the Atlantic Ocean and south-east of Africa, some belong to *A. aequorea* and some to *A. macrodactyla*, two species which are not easily confused when they are tolerably well preserved. None of the other Atlantic species are represented. As mentioned in my paper on the medusae of the Great Barrier Expedition (Kramp 1953, p. 299), I consider *A. macrodactyla* and *A. pensilis* as two distinct species, and in the present collection not a single specimen has given rise to any suspicion of belonging to *A. pensilis*. Measurements and countings were carried out in as many specimens as possible.

Aequorea aequorea (Forskål 1775)

1775 *Medusa aequorea* Forskål.
1809 *Aequorea forskalea* Péron & Lesueur.
1953 *Aequorea forskalea* Russell, p. 342. Pl. 21, fig. 3; Pl. 32, figs. 1, 2. Text-figs. 220A, 221.

Occurrence: St. 446. 9. x. 30. 36° 14′ S, 16° 09′ 45″ E. South-west of Cape of Good Hope. Net: N 100 B 106–0 m. 2 specimens, diam. 25 mm. and 100 mm.
St. 1230. 23. xii. 33. 6·7 miles north 62° W of Dungeness Light, Strait of Magellan. Net: BNR 27 m. 6 specimens, diam. 40–125 m.
St. 1889. 23. xi. 36. 45° 59′ 48″ S, 66° 41′ 42″ W. Net: N 100 B 68–0 m. 1 specimen, diam. 110 mm.
St. WS 2. 13. ix. 26. 22° 24′ S, 13° 25′ E. Off Walvis Bay, South-West Africa. Net: N 100 H 62 m. 7 specimens, diam. 68–85 mm. and some fragments.
St. WS 95. 17. iv. 27. 48° 58′ 15″ S, 64° 45′ W. Net: OTC 109–108 m. 1 specimen, diam. 62 mm.
St. WS 106. 24. iv. 27. 48° 25′ S, 65° 00′ W. Net: N 70 H 0–5 m. 3 specimens, diam. 35–100 mm.
St. WS 749. 18. ix. 31. 52° 39′ 30″ S, 69° 53′ 30″ W. Net: NR 40(–0) m. 1 specimen, diam. 95 mm.
St. WS 770. 21. x. 31. 46° 03′ S, 66° 34′ W. Net: N 70 B 57–0 m. 1 specimen, diam. 70 mm.
St. WS 777. 3. xi. 31. 45° 56′ S, 66° 24′ W to 45° 58′ S, 66° 27′ W. Net: OTC 98–99 m. 1 specimen, diam. 80 mm.

With the exception of St. 446 and St. WS 2, the localities are near the coast of southern Patagonia.

Measurements of 13 specimens gave the following results:

Diam. (mm.)	No. of radial canals	No. of tentacles
25	112	*c.* 35
52	106	*c.* 50
55	102	*c.* 45
74	50	*c.* 100
75	53	*c.* 106
77	52	?
80	45	*c.* 75–80
85	49	*c.* 100
95	*c.* 125	?
100	125	75
110	140	?
120	160	*c.* 90
125	112	?

The specimen, 25 mm. wide (St. 446), has an uncommonly large number of radial canals in proportion to its size. The variability is considerable, and it is remarkable that in some specimens the tentacles are much more numerous than the radial canals, whereas in other specimens the opposite is the case. In all the specimens the number of rudimentary bulbs is almost equal to the number of tentacles.

The size of the specimens according to the seasons is as follows:

Month	Sept.	Oct.	Nov.	Dec.	April
Diam. (mm.)	68–95	25–120	80–110	40–125	35–100

Thus, large as well as medium-sized specimens were found at any time within the period between November and April. It must, however, be remembered that the specimens preserved give no adequate impression of the stock actually present at the time. According to a note on the label of St. WS 2 '82 others of this species were thrown away'.

Distribution. Owing to confusion with other species, the distribution of *A. aequorea* cannot be stated with certainty. It occurs in the Mediterranean, and it seems to be generally distributed in the coastal waters of the Atlantic Ocean, though apparently it is rare in the tropical belt. On the east coast of North America it occurs as far north as off New York, on the European coasts up to the southern parts of the west coast of Norway. There are two previous records from the west coast of Africa: Senegal (Ranson 1949, p. 128) and the Gulf of Guinea (Kramp 1955, p. 265). The present records from the southern coasts of Africa and South America are considerably farther south than any previously known. I am in doubt as to the correctness of the records from the Pacific coast of North America. On the other hand, I have recently seen some specimens taken in the Persian Gulf.

Aequorea macrodactyla (Brandt 1838)

1838 *Mesonema macrodactylum* Brandt, p. 359. Pl. 4.
1904 *Aequorea maldivensis* Browne, p. 732. Pl. 56, figs. 4–12.
1905 *Mesonema macrodactylum* Maas, p. 40. Pl. 8, figs. 51, 54.
1909 *Aequorea macrodactylum* Bigelow, p. 174. Pl. 36, figs. 5–10.
1910 *Aequorea macrodactyla* Mayer, p. 333.
1911 *Mesonema coelum pensile* Vanhöffen, p. 230. Text-fig. 21, in part.
1912*a* *Mesonema coelum pensile* Vanhöffen, p. 371.
1938*b* *Aequorea macrodactyla* Thiel, p. 332. Text-fig. 9.
1953 *Aequorea macrodactyla* Kramp, p. 294.
1953 *Aequorea pensilis* Russell, p. 355. Pl. 33, figs. 1–5. Text-figs. 220C, D, 225.

Occurrence: St. 87. 25. vi. 26. 33° 53′ 45″ S, 09° 26′ 30″ E. Net: TYF 1000(–0) m. 3 specimens, diam. 10–12 mm.
St. 89. 28. vi. 26. 34° 05′ 15″ S, 16° 00′ 45″ E. Net: TYF 1000(–0) m. 25 specimens, diam. 5–20 mm.
St. 100. 1–4. x. 26. 33° 20′ S, 15° 18′ E to 33° 46′ S, 15° 08′ E. Net: TYF 0–5 m. 15 specimens, diam. 7–42 mm., and several fragments. TYF 475(–0) m. 7 specimens, diam. 6–20 mm. TYF 2500(–0) m. 1 specimen, diam. 12 mm.
St. 256. 23. vi. 27. 35° 14′ S, 06° 49′ E. Net: TYF 850–1100(–0) m. 28 specimens, diam. 5–20 mm.
St. 1370. 18. v. 34. 39° 46′ 36″ S, 38° 18′ 24″ E. South-east of Africa. Net: N 100 B 113–0 m. 29 specimens, diam. 4–21 mm.
St. 1568. 11. iv. 35. 34° 47′ 36″ S, 34° 27′ 54″ E. South-east of Africa. Net: TYFB 1400–0 m. 11 specimens, diam. 8–29 mm.
St. 1569. 12. iv. 35. 31° 50′ 18″ S, 32° 20′ 30″ E. South-east of Africa. Net: TYFB 1200–500 m. 7 specimens, diam. 7–20 mm.
St. 1598. 23. x. 35. 07° 10′ 48″ S, 03° 31′ 18″ W. Gulf of Guinea. Net: TYFB 460–300 m. 3 specimens, diam. 11–12 mm.
St. 1600. 25. x. 35. 12° 43′ 18″ S, 00° 20′ 12″ E. Net: TYFB 400–330 m. 7 specimens, diam. 10–20 mm.
St. 1762. 4. v. 36. 31° 57′ 18″ S, 44° 23′ 12″ E. South-east of Africa. Net: TYF 70 B 850–600 m. 1 specimen, diam. 12 mm.
St. 2035. 7. iv. 37. 33° 57′ 12″ S, 16° 12′ 12″ E. Net: TYFB 950–750 m. 2 specimens, diam. 14–17 mm.
St. 2050. 26. iv. 37. 20° 26′ S, 02° 16′ W. Net: N 450 B 430–0 m. 1 specimen, diam. 14 mm.
St. WS 90. 7. iv. 27. 52° 18′ S, 68° 00′ W to 52° 19′ 30″ S, 67° 57′ W. Net: N 7–T 82–81 m. 3 specimens, diam. 27–40 mm.
St. WS 106. 24. iv. 27. 48° 25′ S, 65° 00′ W. Net: N 70 H 0–5 m. 1 specimen, diam. 40 mm.
St. WS 657. 24. vi. 31. 15° 38′ 18″ S, 75° 53′ 24″ W. On the coast of Peru. Net: N 100 B 67–0 m. 1 specimen, diam. 27 mm.
St. WS 832. 1. ii. 32. 50° 49′ S, 67° 55′ W. Net: N 100 B 75–0 m. 6 specimens, diam. 22–52 mm.
Stns 1370, 1568, 1569 and 1762 are south-east of Africa, all the other localities are off the west coast of Africa.
St. WS 657 is on the Pacific coast of Peru, the other localities are off the southernmost part of the coast of Patagonia.

In all the specimens the tentacle bulbs have the broad base with an abaxial keel clasping the edge of the umbrella margin, which is characteristic of *A. macrodactyla* in contradistinction to *A. pensilis*, and numerically they correspond well with the specimens from the Great Barrier Reef previously examined by me. The specimen from the East Pacific, St. WS 657, has a comparatively small number of radial canals: 46 radial canals, 15 tentacles and about 30 young bulbs. The following table gives the dimensions of the specimens taken in the Atlantic and south-east of Africa. Those from South America are marked with an asterisk; these differ in no essential way from the specimens taken off the coasts of Africa.

Diam. (mm.)	No. of radial canals	No. of tentacles	No. of young bulbs
8	33	6	*c.* 30
10	32	8	*c.* 24
11	29	?	?
11	35	5	*c.* 40
11	46	10	*c.* 40
11	50	9	*c.* 40
12	34	?	?
12	42	7	*c.* 40
14	32	8	40
14	48	8	*c.* 50
17	43	*c.* 8	*c.* 40
*22	70	*c.* 15	60
*25	76	*c.* 15	*c.* 80
*27	84	15	*c.* 90
*29	84	17	*c.* 100
*31	88	12–15	*c.* 120
32	66	*c.* 14	*c.* 50
*40	105	*c.* 25	*c.* 110
*52	106	15	150–200

Size of the preserved specimens according to the seasons:

Month	Oct.	Feb.	April	May	June
Diam. (mm.)	6–42	22–52	7–40	4–21	5–20

DISTRIBUTION. Widely distributed in the warm parts of the Indian and Pacific Oceans from East Africa to America. Vanhöffen (1911) united several different species under the name *Mesonema coelum pensile*; the specimens recorded by him from near the coasts of South Africa, in the Benguela Current as well as in the Agulhas Current, probably belong to *Aequorea macrodactyla*, as far as can be seen from the accompanying measurements. At least, Vanhöffen's fig. 21 evidently represents a portion of the umbrella-margin of this species. It is likewise probable that the records from Port Natal and west of Ascension Island (Vanhöffen 1912*a*) apply to the same species. Moreover, *A. macrodactyla* is recorded from Walvis Bay on the West African coast by Thiel (1938*b*). It may also be met with on the southern parts of the British coasts (Russell 1953). The present records from the neighbourhood of South Africa are not very surprising, but it is interesting that the species was taken as far north as 7° south of the equator. It has not been previously recorded from the Atlantic coast of South America, where 'William Scoresby' found it between Port Deseado and the Strait of Magellan.

Aequorea coerulescens (Brandt 1838)

1838 *Mesonema coerulescens* Brandt, p. 360. Pl. 5.
1909 *Aequorea coerulescens* Bigelow, p. 177. Pl. 4, fig. 4; Pl. 35, figs. 3–8.
1938 *Aequorea coerulescens* Boone, p. 35. Pl. 5 and 6.

OCCURRENCE: St. WS 657. 24. vi. 31. 15° 38′ 18″ S, 75° 53′ 24″ W. Off the coast of Peru. Net: N 100 B 67–0 m. 2 specimens.

St. WS 828. 30. i. 32. 50° 51′ S, 61° 42′ W. Near the Falkland Islands. Net: N 100 B 128–0 m. 1 specimen.

This species is at once conspicuous by its numerous tentacles. One of the specimens from St. WS 657 is 80 mm. in diameter with 82 radial canals, with between 320 and 400 tentacles and numerous small bulbs; the other specimen from the same locality is about 70 mm. wide, but it is badly preserved, and canals and tentacles cannot be counted. The specimen from St. WS 828 is very large, about 145 mm. in diameter; it has 110 radial canals and about 500 tentacles, 3–7 between adjacent radial canals.

DISTRIBUTION. Originally described from the northern Pacific by Brandt. Recorded from two localities off Aguja Point in northern Peru (Bigelow 1909) and Valparaiso, Chile (Boone). Records from Vancouver (Agassiz 1865, p. 108) and from Unalaska Island and San Diego (Torrey 1909, p. 28) are doubtful. Also found in Mutsu Bay and near Shimoda, Japan (Uchida 1947*b*). The present record from Peru is inside the previously known area of distribution, but the find near the Falkland Islands is of considerable interest. The species has once before been found in the Atlantic, viz. off Luderitz Bay in South-West Africa (Ranson 1949, p. 128).

Aequorea spp. indeterm.

OCCURRENCE: Stns 87, 100, 268, 407, 709, 1374, 1573, 1575, 2053.

Most of these are young stages, as small as 3 mm. in diameter, but there are also some fragments of larger specimens.

Zygocanna vagans Bigelow 1912

1912 *Zygocanna vagans* Bigelow, p. 255.
1919 *Zygocanna vagans* Bigelow, p. 315. Pl. 42, figs. 5–7; Pl. 43, fig. 6.
1940 *Zygocanna vagans* Bigelow, p. 299. Fig. 14.
1905 *Aequoride* juv. Maas, p. 44. Pl. 4, figs. 22, 23.

OCCURRENCE: St. 405. 4. vi. 30. 33° 50′ 30″ S, 15° 46′ E to 34° 16′ S, 15° 02′ E. West of Cape of Good Hope. Net: TYFB 1200–0 m. 1 specimen.

The specimen is well preserved, 45 mm. in diameter; the stomach is 28 mm. wide; 25 radial canals leave the periphery of the stomach and reach to the ring-canal. There are 30 tentacles situated at somewhat irregular distances from each other; between successive tentacles there are 3–7 rudiments, with long excretory papillae. The statocysts are very numerous. The radial rows of gelatinous papillae on the subumbrella are very conspicuous. The specimen thus agrees perfectly with the descriptions of *Z. vagans*.

DISTRIBUTION. Malayan Archipelago (Maas 1905); the Philippines (Bigelow 1912 and 1919); off Panama and Colombia (Bigelow 1940). Now also found near the Cape of Good Hope, South Africa.

LIMNOMEDUSAE

Family MOERISIIDAE

Tiaricodon coeruleus Browne 1902

1902 *Tiaricodon coeruleus* Browne, p. 276.
1912*b* *Tiaricodon caeruleus* Vanhöffen, p. 6. Pl. 1, fig. 2; Pl. 2, figs. 2–6.
1939 *Tiaricodon coeruleus* Browne & Kramp, p. 311. Pl. 18, figs. 1–6; Pl. 19, figs. 8–11.
1948*b* *Tiaricodon coeruleus* Kramp, p. 6.

OCCURRENCE: St. 53. 12. v. 26. Port Stanley, East Falkland Island. Net: RM 0–2 m. 3 specimens.
St. 55. 16. v. 26. Entrance to Port Stanley, East Falkland Island. Net: BTS 10–16 m. 4 specimens.
St. 57. 16. v. 26. Port William, East Falkland Island. Net: BTS 15 m. 4 specimens.
St. 58. 19. v. 26. Port Stanley, East Falkland Island. Net: N 70 H 5–0 m. 47 specimens.

The specimens vary between 3 and 12 mm. in diameter.

DISTRIBUTION. This pretty medusa has previously been found in considerable numbers at the Falkland Islands. Also recorded from a locality south of the South Orkney Islands (Kramp) and from the Strait of Magellan and on the Pacific coast of Peru, off Callao (Vanhöffen).

Family PROBOSCIDACTYLIDAE

Proboscidactyla mutabilis (Browne 1902)

1902 *Willia mutabilis* Browne, p. 280.
1912*b* ?*Willia mutabilis* Vanhöffen, p. 7. Text-fig. 2.
1938*a* *Willia mutabilis* Thiel, p. 302.
1939 *Willia mutabilis* Browne & Kramp, p. 302. Pl. 14, figs. 8–9; Pl. 17, figs. 10–12; Pl. 19, fig. 12.

OCCURRENCE: St. 58. 19. v. 26. Port Stanley, East Falkland Island. Net: N 70 H 5–0 m. 24 specimens.
St. WS 832. 1. ii. 32. 50° 49′ S, 67° 55′ W. Near the coast of southern Patagonia. Net: N 100 B 70–0 m. 1 specimen.

The structure, development and variation of this species was described by Browne & Kramp (1939). The variation in twelve of the present specimens may be summarized as follows:

No. of specimens	Diam. (mm.)	No. of main radial canals			No. of tentacles + young bulbs	Average no. of tentacles
		6	7	8		
1	3	.	1	.	34	34
8	4	4	1	3	39–50	44
3	5	2	.	1	38–48	44
Total 12		6	2	4		

DISTRIBUTION. Falkland Islands (Browne); Punta Arenas in the Strait of Magellan (Vanhöffen); north-east of Puerto Madryn and on the Patagonian Bank (Thiel). A very peculiar record is recently given by Nair (1951, p. 57), who thinks he has found this species on the Trivandrum Coast in South-West India.

Family OLINDIIDAE

Aglauropsis conanti Browne 1902

1902 *Aglauropsis conantii* Browne, p. 283.

1939 *Aglauropsis conantii* Browne & Kramp, p. 314. Pl. 18, figs. 7–16.

OCCURRENCE: St. 55. 16. v. 26. Entrance to Port Stanley, East Falkland Island. Net: BTS 10–16 m. 1 specimen.
St. 57. 16. v. 26. Port William, East Falkland Island. Net: BTS 15 m. 1 specimen.
St. WS 89. 7. iv. 27. 53° 01′ S, 68° 07′ W to 52° 59′ 30″ S, 68° 06′ W. Net: N 7–T 23–21 m. 34 specimens. N 4–T 23–21 m. 1 specimen.
St. WS 809. 8. i. 32. 49° 29′ S, 66° 27′ W. Net: N 4–T 108–104 m. 4 specimens. NCS-T 108–104 m. 4 specimens.
St. WS 812. 10. i. 32. 51° 17′ S, 68° 50′ W. Net: N 7–T 53–55 m. 50 specimens.
St. WS 832. 1. ii. 32. 50° 49′ S, 67° 55′ W. Net: N 70 B 75–0 m. 11 specimens. N 100 B 75–0 m. 15 specimens.
St. WS 833. 1. ii. 32. 52° 28′ S, 68° 00′ W. Net: N 7–T 38–31 m. 4 specimens.
St. WS 847. 9. ii. 32. 50° 15′ S, 67° 59′ W. Net: NCS–T 51–57 m. 2 specimens.

The localities where this species was collected by 'William Scoresby' are near the coast around the eastern entrance to the Strait of Magellan. 'Discovery' only found it at the Falkland Islands. Most of the specimens of this beautiful and interesting medusa are in an excellent condition. The largest specimens previously observed were 22 mm. in diameter; some of the present specimens are 25 mm. wide. Their size according to the seasons are as follows:

Month	Jan.	Feb.	April	May
Diam. (mm.)	5–25	7–25	8–18	9–12
Specimens	58	32	35	2

The previous records were from November to February.

DISTRIBUTION. Up to now this species has only been observed at the Falkland Islands, where it was found in great abundance. As will be seen from the above records, it is also common in the region of the Strait of Magellan.

Gossea brachymera Bigelow 1909

(Pl. V, figs. 2, 3, text-fig. 8)

1909 *Gossea brachymera* Bigelow, p. 103. Pl. 30, figs. 1–10.

1939 *Gossea brachymera* Russell, p. 707. Pl. 1; text-figs. 1–3.

OCCURRENCE: St. WS 89. 7. iv. 27. 53° 01′ S, 68° 07′ W to 52° 59′ 30″ S, 68° 06′ W. Net: N 7–T 23–21 m. 1 specimen. N 4–T 23–21 m. 1 specimen.
St. WS 833. 1. ii. 32. 52° 28′ S, 68° 00′ W. Net: N 7–T 38–31 m. 40 specimens.

Both localities are near the eastern entrance to the Strait of Magellan.

Bigelow described this species from a single small specimen, 5 mm. in diameter, taken in Acapulco Harbour on the Pacific coast of Mexico. A new description was given by Russell, who examined 17 specimens, 4·5–7·5 mm. wide, taken off Grand Island, Louisiana, in the Gulf of Mexico. From a zoogeographical point of view it is very interesting that this same species also occurs off the southernmost part of South America. The specimens collected by 'William Scoresby' are much larger than any seen before, being up to 20 mm. in diameter; they also have a much larger number of tentacles, but in all structural details they agree so well with the previous descriptions that there can be no doubt of their identity. The following remarks are mainly occasioned by the considerable size of the specimens. Some of them are in a very good state of preservation.

The two specimens from St. WS 89 are 14 mm. and 16 mm. wide; the numerous specimens from St. WS 833 vary between 11 mm. and 20 mm. in diameter. The general shape of the medusae agrees

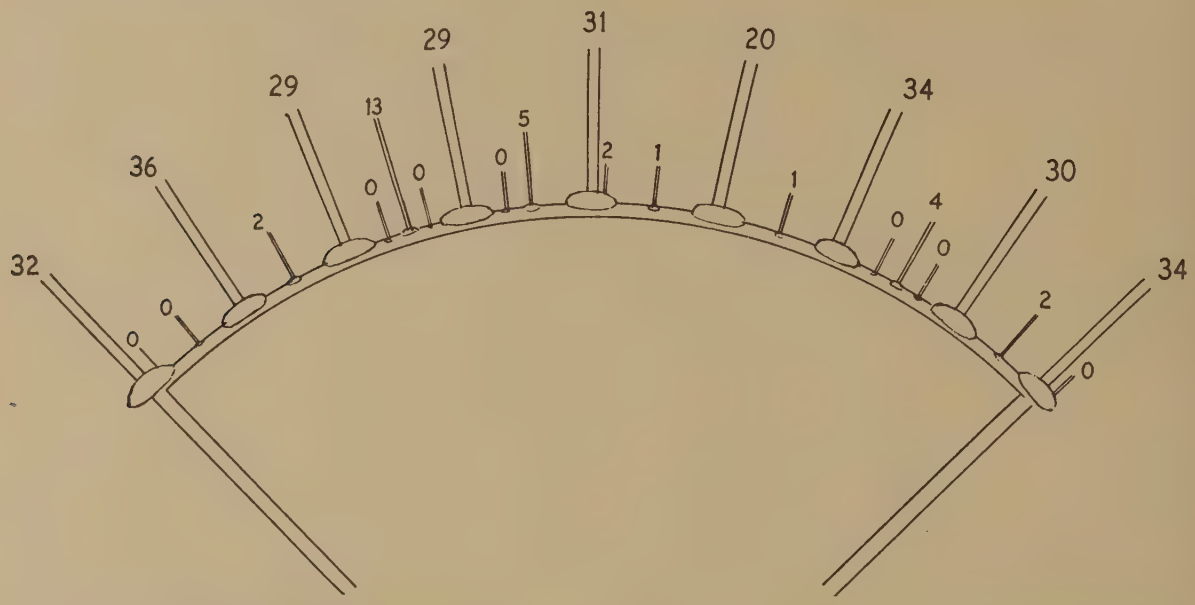
with Russell's figure, though the gelatinous substance of the umbrella is not quite as thick in the present specimens. The gastric peduncle and the nematocyst clusters on the mouth-rim are distinct. In the smaller specimens the gonads are as figured by Russell, being somewhat laterally compressed, wavy, and attached to the subumbrella along the greater part of the radial canals, from the base of the peduncle almost to the ring-canal; but in the larger specimens the gonads are considerably prolonged, terminating in a large, pendent sac, the length of which may be equal to the attached portion.

The structure and arrangement of the marginal tentacles need some additional remarks. Apparently there are two kinds of tentacles; Russell designates them as large tentacles and rudimentary or dwarf tentacles, the latter being regarded as 'true tentacles in an arrested state of development'. The margin of the umbrella is divided into a number of swellings of nematocyst tissue, one at the base of each tentacle, large and oval below the large tentacles, very small below the small tentacles. The relative number of large and small tentacles will be discussed below, sometimes they are almost regularly alternate. According to Russell the tentacles have 'a solid core of endoderm cells arranged in several rows'. The term 'solid tentacles', however, should be used only when the endoderm consists of one row of cells; when there are several rows it means that a central canal is present, though under certain circumstances it may be so tightly compressed that the cavity is obliterated. As a matter of fact, in this species the large tentacles are hollow, even with a distinct and sometimes rather spacious central cavity, especially in the proximal portions. In the smallest 'dwarf' tentacles the endoderm is uniserial in the distal part, multiserial in the proximal part, and during growth the multiserial endoderm extends farther outward towards the tip. Each large tentacle is provided with a terminal knob and several transverse bands of nematocysts encircling the tentacle in its distal part; for most of its length, however, the bands surround only part of the circumference, tapering in width towards the proximal end of the tentacle, the innermost side being destitute of nematocysts. The nematocyst clusters are on the abaxial side of the tentacle. In the largest tentacles the number of nematocyst clusters is frequently about 35, in exceptional cases as many as 40. The basal part of the tentacle is adnate to the exumbrella as described by Russell.

The 'dwarf' tentacles differ slightly from the descriptions by Bigelow and Russell. When quite young they are slender and pointed without indication of a terminal knob, but later on a tiny knob begins to appear, and as the length of the tentacle increases, a small cluster of nematocysts is developed abaxially a little inside the tip, then a second one, and so on. Already in the youngest stage these small tentacles have some nematocysts scattered throughout their length (small ones about 30μ in length), but as soon as the knob and the clusters make their first appearance, they contain nematocysts of a much larger type, about 60 μ long. I have seen every transitional stage from tiny 'dwarf' tentacles with a pointed tip to fully developed tentacles with numerous bands of nematocysts.

The small specimen, 5 mm. wide, examined by Bigelow had 16 large tentacles and 8 minute dwarf tentacles, all of which were situated on the marginal swellings below the perradial and interradial tentacles, whereas no dwarf tentacles were attached to the 8 adradial tentacles. In the slightly larger specimens examined by Russell, the large tentacles were likewise 16 in number, each of the perradial and interradial ones flanked by a dwarf tentacle, but there were also 16 small tentacles, one in the middle of the space between every two large tentacles and each with a minute basal swelling of its own. This ideal arrangement may also be seen in larger specimens with a greater number of tentacles; there is always one dwarf tentacle situated on each of the perradial and interradial swellings, whereas all the other small tentacles are situated between the large ones. A regular alternation, however, is rarely seen, because by-and-by small tentacles develop into large tentacles, and the larger the specimen the more irregular is the succession and the relative number of large and small tentacles. When a small tentacle has obtained a certain number of nematocyst clusters, a new small tentacle appears

beside it, or sometimes one on each side of it. The accompanying diagram (text-fig. 8) shows an example of the arrangement of the tentacles in a quadrant of a specimen 14 mm. in diameter; the figures denote the number of nematocyst clusters in each tentacle. The dwarf tentacles on the perradial and interradial swellings are always to the left of the root of the corresponding large tentacle when seen from the exumbrellar side.



Text-fig. 8. *Gossea brachymera.* Diagram of one-quarter of the umbrella margin, showing the arrangement of large and small tentacles. The figures denote the number of nematocyst clusters in each tentacle.

The number of large and small tentacles in specimens of various sizes are shown in the following table:

	Diam. (mm.)	No. of large tentacles	No. of small tentacles	Total no. of tentacles	Ratio of no. of small and large tentacles
Bigelow 1909	5	16	8	24	0·5
Russell 1939	$4\frac{1}{2}$–$7\frac{1}{2}$	16	24	40	1·5
St. WS 833	11	44	32	76	0·73
	12	36	48	84	1·33
	13	40	?	?	?
	14	40	48	88	1·20
	15	44	44	88	1·00
	17	48	42	90	0·88
	17	52	36	88	0·69
	17	56	32	88	0·57
	17	56	34	90	0·61
	19	52	50	102	0·96
	20	48	40	88	0·83
	20	56	32	88	0·57
	20	60	40	100	0·66

It will be seen that the relative numbers of large and small tentacles are subject to considerable variation, whereas the total numbers are not very variable, being 88–102, average 91, in specimens of more than 13 or 14 mm. in diameter. Apparently, therefore, the final number is attained when the medusa is about 13 mm. wide. It will also be seen that in specimens 12–14 mm. wide there are more

small than large tentacles, whereas in all specimens above 17 mm. in diameter large tentacles are more numerous than small ones.

The statocysts are as described by Russell. They are internal vesicles inside the perradial and interradial marginal swellings immediately at the base of the dwarf tentacle. According to Russell the endodermal root of the dwarf tentacle divides into two; I have found it divided into three branches, one on each side and one in front of the vesicle (Pl. V, figs. 2–3). When seen from the exumbrellar side, these branches may appear as 1–3 small protuberances above the outline of the swelling; this is what Bigelow has seen and figured in Pl. 30, fig. 5.

Evidently the eight small tentacles situated on the perradial and interradial swellings never develop into large tentacles; even in the largest specimens they are very small, usually without nematocyst knobs, though sometimes with a small terminal knob, rarely also with a small cluster of nematocysts inside the terminal knob. Thus these eight small tentacles may really be designated as dwarf tentacles in an arrested stage, whereas all the other small tentacles may develop into large ones. Following Bigelow and Russell, therefore, one may regard each of the large perradial and interradial tentacles with its attendant dwarf tentacle as a 'group', which justifies the reference of this species to the genus *Gossea*.

DISTRIBUTION. Acapulco Harbour, Pacific coast of Mexico (Bigelow); coast of Louisiana, Gulf of Mexico, in brackish water (Russell); eastern entrance to the Strait of Magellan ('William Scoresby').

TRACHYMEDUSAE

Family PTYCHOGASTRIDAE

Ptychogastria polaris Allman 1878

1878 *Ptychogastria polaris* Allman, p. 290, 3 figs.
1881 *Pectyllis arctica* Haeckel, p. 11. Pl. 3, 4.
1903 *Ptychogastria polaris* Browne, p. 24. Pl. 4, figs. 1, 2; Pl. 5, figs. 6–8.
1912*a* *Ptychogastria opposita* Vanhöffen, p. 386. Pl. 25, fig. 6. Text-fig. 20.
1947 *Ptychogastria polaris* Kramp, p. 4. Pl. 1, figs. 1–4; Pl. 6, figs. 1–2.

OCCURRENCE: St. 177. 5. iii. 27. 63° 17′ 30″ S, 61° 17′ W. Twenty-seven miles south-west of Deception Island, South Shetlands. Net: DLH 1080 m. 6 specimens.
St. 1958. 5. ii. 37. 61° 17′ 54″ S, 52° 50′ 48″ W. East of the South Shetland Islands. Net: DRR 830 m. 1 specimen.

Vanhöffen gave a beautiful coloured drawing of the antarctic form of *Ptychogastria* (*P. opposita*), of which six specimens were taken near the Gauss Station. He gave no real description, but only some remarks for comparison between the arctic and the antarctic forms, which he found very similar to each other, and he erected the new species *opposita* mainly on account of its great geographical separation. The Discovery specimens from St. 177 are 8–10 mm. in diameter and much contracted. All the tentacles are lost, but their grouping around the umbrella margin can be distinctly seen. The specimen from St. 1958 is fairly well preserved, though here also most of the tentacles are broken off. It is 12 mm. wide, only slightly contracted, so that the 16 meridional ridges on the exumbrella are faintly indicated. There are about 48 groups of tentacles; the male gonads are well-developed. The umbrella is more transparent than usually seen in this species, and the anatomical details of the medusa can therefore be distinctly observed. According to a note on the label the central part of this specimen was a rich crimson.

I have compared the specimens with specimens from the Arctic, and I cannot see any distinguishing features. I think therefore, that we may safely unite the two forms and designate *Ptychogastria polaris* as a bipolar species. The medusae were taken in dredges hauled along the bottom of the sea, and in the specimens from St. 177 numerous grains of dark sand are found in their subumbrellar cavities;

the specimen from St. 1958 is clean; it was taken in a 'rectangular dredge bag bent on to a Russell frame with skids to raise it clear of deep mud on the sea floor'. In arctic waters also this medusa is most frequently taken at the bottom, though occasionally it may be found swimming in the upper layers.

Another antarctic medusa, *Pectis antarctica* Haeckel, has been referred to this genus; it was found by the 'Challenger' Expedition south-south-east of Kerguelen Island at a depth of 1260 fathoms. Haeckel (1881, p. 15, Pls. 5 and 6, figs. 1–20) gave detailed descriptions and numerous figures of its morphology; but as the same applies to his description of '*Pectyllis arctica*' (= *Ptychogastria polaris*), and as Browne (1903) found 'serious errors' in the description of this latter species, we can regard his description of the former with some scepticism. If Haeckel's account of *P. antarctica* is correct, this species is entirely different from *P. polaris* (including *opposita*), but, unfortunately, the description can never be verified. I have seen the type specimen in the British Museum (Nat. Hist.), and the bottle only contains some tiny fragments, which give no idea of the original appearance of the medusa. As far as I could see, however, the numerous and closely packed tentacles were not arranged in groups as in *P. polaris*. The ring of tentacles seems to be homogenous, equally thick and dense everywhere on the fragments still available. I found no indication of 'höher inserierten einzelnen Saugnäpfen'; the tentacles are all broken near their base and, as already remarked by Browne (1903), the marks left on the exumbrella may well resemble sucking discs. I have previously discussed the relationships of the third Haeckelian species, *P. asteroides*, from the Adriatic Sea and the Straits of Gibraltar (Kramp 1947, p. 5); this seems to be a true *Ptychogastria*, though the tentacles are described by Haeckel as hollow.

Distribution. In northern waters, *P. polaris* has a circumpolar distribution in arctic and subarctic areas (see the chart in Kramp 1947). In antarctic seas it has now been found in two widely separated areas: about 90° E and 53–61° W.

Family Halicreidae

The Discovery collection comprises four genera and five species of the family Halicreidae, namely: *Halicreas minimum* Fewkes; *Haliscera conica* Vanhöffen; *Haliscera racovitzae* Maas; *Botrynema brucei* Browne; *Halitrephes maasi* Bigelow. Most of these species are represented by numerous specimens, and now that I have been able to examine this extensive material I am more convinced than ever that my earlier conception of the delimitation of these species is correct (Kramp 1947.)

Systematic confusion has occurred mainly because Vanhöffen (1902*b*), in his 'Valdivia' Report, established five new species of *Halicreas* and *Haliscera*, only one of which, *Halicreas papillosum*, was properly described. This has subsequently been shown to be identical with *Halicreas minimum* Fewkes (1882). The other four species, *Halicreas glabrum* and *rotundatum*, *Haliscera alba* and *conica*, were beautifully figured by the artist of the 'Valdivia' Expedition, but the text gave only some scattered remarks on certain distinguishing features.

Later authors have been much in doubt as to the identities of these species of Vanhöffen's. The confusion was augmented by Thiel (1936) who united three of them, *Halicreas glabrum*, *rotundatum* and *papillosum*, in the single species *H. papillosum*, and combined Vanhöffen's two species, *Haliscera alba* and *conica* with Maas's (1906*b*) species *Haliscera racovitzae*. Thiel's distribution chart (1936, p. 36) is therefore unreliable.

I have been fortunate in having numerous specimens of Halicreidae to examine from the same areas whence Vanhöffen's species were derived, and I have never seen any resembling *Halicreas rotundatum* and *Haliscera alba*, both of these species being based on very scanty material. I therefore designate *Halicreas rotundatum* and *Haliscera alba* as obsolete species on the ground of inadequate description. Nor can we be sure that the figures in the 'Valdivia' Report are reliable. In the case of the lovely coloured drawing of *Halicreas glabrum*, at any rate, an entirely wrong impression of the

umbrella-margin is given. *Halicreas glabrum*, is probably identical with the species described by Browne (1908) as *Botrynema brucei*. The peculiar arrangement of the tentacles in sixteen groups entirely escaped the notice of the 'Valdivia' artist as well as of Vanhöffen himself.

Apart therefore from *Halicreas papillosum*, which specific name according to the rule of priority gives place to *Halicreas minimum* Fewkes (1882), of Vanhöffen's four remaining species only *Haliscera conica* can be retained as genuine. Vanhöffen recorded two specimens between South Africa and the Antarctic Continent. No proper description was given, but the few remarks in the text together with the two figures enable us to identify this species with certainty. The conical shape of the umbrella as shown in his Pl. 9, fig. 6, is very characteristic, and is retained and perfectly recognizable even in poorly preserved specimens. Moreover, in this case Vanhöffen has given an excellent figure of a section of the umbrella-margin and two of the radial canals with the gonads. I have seen numerous specimens in the Discovery material, as well as in other collections, which agree perfectly in every detail.

Haliscera racovitzae Maas is a distinct species and is represented in the present collection.

Halicreas minimum Fewkes 1882

(Text-fig. 18)

1882 *Halicreas minimum* Fewkes, p. 306.

1902*b* *Halicreas papillosum* Vanhöffen, p. 68. Pl. 9, figs. 7–8; Pl. 11, fig. 30.

1909 *Halicreas papillosum* Bigelow, p. 138. Pl. 3, fig. 3; Pl. 33, figs. 8, 9; Pl. 34, figs. 1–3, 5, 8, 10, 11.

1938 *Halicreas minimum* Bigelow, p. 122.

1947 *Halicreas minimum* Kramp, p. 7. Pl. 6, fig. 3.

Occurrence: Stns 9, 71, 72, 76, 78, 81, 83, 85, 86, 87, 89, 100, 101, 102, 107, 114, 151, 239, 253, 256, 281, 282, 287, 304, 354, 391, 395, 401, 405, 407, 675, 677, 679, 687, 688, 690, 696, 699, 700, 1554, 1567, 1568, 1569, 1576, 1578, 1581, 1582, 1585, 1587, 1600, 1639, 1707, 1718, 1747, 1749, 1750, 1753, 1754, 1757, 1758, 1762, 1766, 1770, 1808, 1863, 1917, 1919, 1944, 1970, 1972, 1974, 1981, 1989, 1991, 1995, 1999, 2001, 2006, 2008, 2033, 2035, 2038, 2040, 2042, 2044, 2048, 2053, 2055, 2057, 2059, 2061, 2063, 2064, 2066. (For details of station positions, date, etc., see Table 1, p. 110, and text-fig. 18, p. 102.)

All the specimens were taken in hauls through intermediate or deep layers, with the exception of two young specimens, about 6 mm. wide, which were taken in a haul with the young-fish trawl, TYF, 300(–0) m. at St. 282.

Many of these numerous localities are within an area between the west coast of Africa and the east coast of South America, north of 40° S, from which the species was previously known, and the six stations off the east coast of Africa are not far from an area from which it was recorded by Browne (1916, p. 195). On the other hand, the long series of stations at about 32° S, from the south-east coast of Africa eastwards to 83° 36′ E, traverses an area whence it has not previously been recorded. Moreover, with two exceptions, it was unknown south of 40° S, and 'Discovery II' has taken it in numerous localities across the Atlantic Ocean south of this latitude and in the area east of the Falkland Islands, around South Georgia and the South Sandwich Islands and farther southwards along the eastern border of the Weddell Sea as far as 66°–67° S (Stns 2001, 2006, 2008). The only previous records from these southern waters were given by Browne (1908, p. 237, 72° 02′ S, 23° 40′ W) and by Kramp (1948*b*, p. 7, two localities north-west of South Georgia). 'Discovery II' also found it much farther east in the antarctic region, between 92° 06′ E and 129° 25′ E, in latitudes between 58° 35′ S and 64° 22·6′ S (Stns 1639, 1707 and 1718). Thus the Discovery collections have increased the known area of distribution of this species very considerably.

Distribution. *Halicreas minimum* seems to be generally distributed in the deep parts of all the oceans, except the Mediterranean and the arctic basins. It is common in the North Atlantic, but it does not cross the submarine ridges between Scotland, Iceland, Greenland and Baffin Land. From

this threshold it is generally distributed southwards into the antarctic region. In the Pacific it has probably a much more extensive distribution than is generally known; it is common in the tropical East Pacific, but it has not yet been taken off the west coast of North America, and there are only a few records from the western Pacific (Bering Sea, Sea of Okhotsk, Japan, North-East Australia). The previous records from the Indian Ocean were likewise few and scattered, until 'Discovery II' found it in numerous localities in the southern parts of this ocean.

Haliscera conica Vanhöffen 1902

(Text-fig. 17)

1902*b* *Haliscera conica* Vanhöffen, p. 72. Pl. 9, fig. 6; Pl. 11, fig. 33.
1910 *Halicreas conica* Mayer, p. 394. Fig. 248.
1912*a* *Haliscera conica* Vanhöffen, p. 381.
1936 *Halicreas album* Thiel, p. 37, in part.
1947 *Haliscera conica* Kramp, p. 6.

Occurrence: Stns 100, 102, 137, 282, 302, 303, 322, 335, 337, 344, 354, 391, 568, 588, 696, 1056. WS 29, WS 30, WS 61, WS 160, WS 190.

Some poorly preserved specimens from Stns 100, 301 and 322 probably also belong to this species. (For details of station positions, date, etc., see Table 1, p. 110, and text-fig. 17, p. 101.)

Stns 100 and 102 are near the Cape of Good Hope, St. 282 is in the Gulf of Guinea, Stns 568 and 588 are west of Graham Land, Antarctic, and St. 696 is south-west of the Cape Verde Islands. The other localities are in the neighbourhood of South Georgia and between this island and the southern point of South America.

Besides the real *Haliscera conica*, Thiel (1936) included under the name of *Halicreas album*, *Haliscera racovitzae* Maas, which is a distinct species, and the doubtful species, *Haliscera alba* Vanhöffen. Most of the specimens collected by the 'Meteor' Expedition and listed by Thiel probably belong to *H. conica*, but some of them may have been *H. racovitzae*.[1]

Some of the specimens in the Discovery collections are in a very good state of preservation, and by comparison it has been possible to identify almost all the other specimens. As mentioned on p. 47, the conical shape of the umbrella is very characteristic and resistant even in badly preserved specimens, and as a rule most of the tentacles and radial canals and gonads are retained which, in conjunction with the shape of the umbrella, is sufficient to put the identification beyond any doubt.

The specimens in the present collection vary in diameter between 3 and 16 mm. In adult specimens the height of the umbrella is about two-thirds the diameter; young specimens are only half as high as wide, and the gelatinous substance is thinner than in the adult. The gonads begin to appear when the diameter is 10–12 mm. In the adult the gonads are oval, situated a little nearer to the stomach than to the ring-canal. In a specimen 15 mm. wide the gonads are 2 mm. long, separated from the stomach by 2 mm., from the ring-canal by 2·5 mm. Female gonads contain 7–9 large eggs. The velum is broad, 3 mm. in a specimen 15 mm. wide. The marginal organs agree perfectly with Vanhöffen's Fig. 33. It is characteristic of this species, in contradistinction to *racovitzae* and *bigelowi*, that the thickening of the marginal nematocyst tissue at the base of each tentacle is very broad, forming a broad basal bulb. Vanhöffen's Fig. 33 shows 9 tentacles in the octant, in Fig. 6 there are 11, which may be an artistic exaggeration. In the present collection I have counted the tentacles as follows:

Diam. (mm.)	3	6	7	8	10	11	12	13	14	15
No. of tentacles	16	32	36	48	48	56–60	64	64–70	64–70	*c.* 72

[1] *Homoeonema alba* from the tropical East Pacific (Bigelow 1909, p. 142) probably belongs to the species which later on was described by me (Kramp 1947, p. 8) as a new species, *Haliscera bigelowi*; it occurs in the North Atlantic.

The number of marginal clubs is 16 in adult specimens, two in each octant, and they are arranged in a characteristic way, which is in accordance with Vanhöffen's figure. One of them is always placed near a radial canal separated from it by one tentacle, usually to the right when seen from the exumbrellar side, exceptionally to the left; the other marginal club is a little to the left of the middle point of the octant. Young specimens up to 7 mm. in diameter have only one marginal club in each octant, always the one developed nearest to a radial canal; the club near the middle of the octant appears later. In all stages of development the tentacles are of different sizes, but of the same structure; they may be about as long as the diameter of the umbrella, but as a rule all or most of them are broken off near their base.

The majority of the specimens were taken in hauls through the intermediate water-layers, mainly in hauls of 500–250 m. and 750–500 m., a few in 250–100 m., very few in vertical hauls from very great depths, and these may have been taken at higher levels during hauling because the nets failed to close.

Distribution. Mediterranean (Kramp 1924, p. 29; Ranson 1936, p. 171); several localities between the Canary Islands and the Azores (Ranson 1936); off the west coast of Africa between Cape Verde and the Cape of Good Hope (the Discovery collections); South Atlantic between South Africa and South America (Thiel 1936); subantarctic and antarctic parts of the Atlantic area (Vanhöffen 1902*b*, Thiel 1936, Kramp 1948*b*, p. 6, and the present collection); west of Graham Land in the Pacific sector of the Antarctic (Discovery); also found in the Indian Ocean sector of the Antarctic, near the Gauss Station (Vanhöffen 1912*a*).

Haliscera racovitzae Maas 1906

1906*b* *Homoeonema* (*Haliscera*) *racovitzae* Maas, p. 10. Pl. 1, figs. 3, 4; Pl. 2, fig. 13.
1909 *Homoeonema racovitzae* Bigelow, p. 144.
1910 *Halicreas racovitzae* Mayer, p. 393. Fig. 246.
1931 *Halicreas racovitzae* Thiel, p. 328.
1936 ?*Halicreas album* Thiel, p. 37, in part.
1947 *Haliscera racovitzae* Kramp, p. 6.

Occurrence: St. 355. 9. ii. 30. 54° 13′ 30″ S, 34° 18′ 30″ W to 54° 10′ 30″ S, 34° 16′ 30″ W. East of South Georgia. Net: N 70 V 750–500 m. 1 specimen.

The specimen, which is well preserved, is 7·5 mm. in diameter and 4 mm. in height. The exumbrella is evenly rounded, with no indication of a conical apex, the gelatinous substance being fairly thin and flaccid. Diameter of stomach 3·5 mm., mouth 2 mm. The gonads, male, are broadly egg-shaped, thick (not flat), in the proximal two-fifths of the radial canals close to the stomach. The distal part of the radial canals and the ring-canal are fairly narrow. In each octant there are 6 tentacles, of different sizes, with conical basal bulbs, and two marginal clubs, one separated by one tentacle from the adjacent radial canal to the right (when seen from the exumbrellar side), the other similarly separated from the radial canal to the left by two tentacles. Velum very broad.

This specimen is a perfect image of Maas's beautiful figures, except that it is almost colourless. The species differs distinctly from *H. conica* in the shape of the umbrella, the shape and position of the gonads, the number of tentacles, and their narrow conical bases. I have not the slightest doubt that it is a distinct species. It is not easy to comprehend how Thiel could identify it with *H. alba* Vanhöffen, which has elongated, flat gonads and a much larger number of tentacles. Two specimens from the tropical East Pacific, off Callao, Peru, were referred to *H. racovitzae* by Bigelow (1909) though with some doubt, and it also seems to me the safest course to regard this record as dubious.

Vanhöffen (1912*a*, Pl. 25, fig. 4. Text-fig. 17) has described and figured a medusa taken in the South Atlantic, at about 35° S, and he referred it to *Haliscera racovitzae*, but it cannot possibly belong to this species, nor can it with certainty be referred to any other known species. It was about 10 mm.

wide and had eight very large tentacles opposite to the radial canals and a considerable number of small tentacles in the spaces between the canals.

DISTRIBUTION. *Haliscera racovitzae* seems to be a rare medusa; it has only been recorded with certainty from a few localities in the antarctic region: 70° 09′ S, 82° 35′ W (Maas), the Weddell Sea (Thiel 1931), and east of South Georgia (the present specimen).

Botrynema brucei Browne 1908

(Text-fig. 17)

1902*b* ?*Halicreas glabrum* Vanhöffen, p. 70. Pl. 9, fig. 3.
1908 *Botrynema brucei* Browne, p. 239. Pl. 1, figs. 8–9; Pl. 2, fig. 1.
1912*a* *Botrynema brucei* Vanhöffen, p. 382. Pl. 25, fig. 5. Text-figs. 18–19.
1913 *Botrynema ellinorae* Bigelow, p. 53. Pl. 6, figs. 1–4.
1942 *Botrynema brucei* Kramp, p. 73.
1947 *Botrynema brucei* Kramp, p. 11. Pl. 1, fig. 9; Pl. 2, fig. 3; Pl. 4, fig. 4.
1948*a* *Botrynema brucei* Kramp, p. 6.
1953 *Botrynema brucei* Russell, p. 459. Pl. 27, fig. 1. Text-figs. 303–304.
1936 ?*Halicreas papillosum* Thiel, p. 34, in part.

OCCURRENCE: St. 89. 28. vi. 26. 34° 05′ 15″ S, 16° 00′ 45″ E. Net: TYF 1000(–0) m. 1 specimen.
St. 100. 4. x. 26. 33° 20′ S, 15° 18′ E to 33° 46′ S, 15° 08′ E. Net: TYF 2500–2000 m. 1 specimen.
St. 301. 20–21. i. 30. 52° 36′ 30″ S, 37° 14′ W. Net: N 70 V 750–500 m. 1 specimen.
St. 391. 18. iv. 30. 55° 48′ 30″ S, 52° 35′ W. Net: N 450 H 1200–1300(–0) m. 1 specimen.
St. 677. 27. iv. 31. 31° 16′ 15″ S, 29° 56′ 30″ W. Net: TYFV 1500–1000 m. 1 specimen.
St. 1639. 2. xii. 35. 58° 35′ S, 92° 06′ 12″ E. Net: TYFB 2400–1150 m. 1 specimen.
St. 1702. 17. iii. 36. 64° 20′ 06″ S, 139° 54′ E. Net: TYFB 2000–1250 m. 5 specimens.
St. 1745. 21. iv. 36. 32° 03′ 54″ S, 88° 56′ 54″ E. Net: TYFB 1600–800 m. 1 specimen.
St. 1750. 25. iv. 36. 32° 12′ S, 75° 32′ 36″ E to 32° 13′ 54″ S, 75° 21′ 30″ E. Net: N 450 H 2000–1900 m. 1 specimen.
St. 1753. 27. iv. 36. 32° 00′ 24″ S, 68° 50′ 54″ E. Net: TYFB 2900–1400 m. 1 specimen.
St. 1825. 5. x. 36. 55° 42′ 48″ S, 14° 44′ 06″ W to 55° 44′ 12″ S, 14° 50′ 54″ W. Net: TYF 70 B 1150–600 m. 1 specimen.
St. 1869. 11. xi. 36. 62° 37′ 18″ S, 48° 05′ 12″ W. Net: TYFB 1550–1000 m. 1 specimen.
St. 1871. 12. xi. 36. 64° 04′ 24″ S, 52° 57′ 30″ W. Net: TYFB 1450–1000 m. 1 specimen.
St. 1917. 3. xii. 36. 53° 48′ 42″ S, 46° 27′ 42″ W. Net: TYFB 1400–1000 m. 1 specimen.
St. 1970. 18. ii. 37. 55° 03′ S, 54° 04′ 12″ W. Net: TYFB 1800–1500 m. 1 specimen.
St. 2033. 6. iv. 37. 33° 54′ S, 12° 31′ 12″ E. Net: TYFB 1350–1250 m. 1 specimen.
St. WS 38. 22. xii. 26. 54° 01′ S, 35° 14′ W. Net: N 70 V 1000–750 m. 1 specimen.
St. WS 63. 20. i. 27. 54° 36′ S, 39° 14′ W. Net: N 70 V 1000–750 m. 1 specimen.
St. WS 336. 30. xii. 28. 53° 06′ S, 34° 44′ W. Net: N 70 V 1000–760 m. 1 specimen.

Stns 89, 100 and 2033 are in the neighbourhood of the Cape of Good Hope; St. 677 is farther west in the Atlantic Ocean; Stns 1639 and 1702 are in the Indian Ocean sector of the Antarctic; Stns 1745, 1750 and 1753 are in the central part of the Indian Ocean, between South Africa and Australia. The other stations are in the Weddell Sea (text-fig. 17, p. 101).

Most of the specimens are about 30 mm. in diameter and 25 mm. in height; some of them, especially those collected by 'William Scoresby', are in very good condition, and even the badly preserved specimens may be identified with certainty by means of the shape of the umbrella with its distinct apical knob and the traces of tentacles which are always more or less retained showing the very characteristic arrangement in groups.

Though it seems to me very probable that *Halicreas glabrum* Vanhöffen 1902 is identical with *Botrynema brucei* Browne 1908, I will not use the former name, because that species was not described in a recognizable way, and the figure gave a wrong impression of the appearance of the medusa.

DISTRIBUTION. *Botrynema brucei* is a widely distributed bathypelagic species. It has been found in several localities in the northern Atlantic, south of the submarine ridge between Scotland, Iceland, Greenland and Baffin Land (Kramp 1942, 1947 and 1948*a* Russell 1953). *H. glabrum* Vanhöffen was taken in seven localities off the west coast of Africa, from the Canary Islands to the Cape of Good Hope and in one locality in the central part of the Indian Ocean. The original specimen of *B. brucei* was found in the Weddell Sea (Browne 1908), and it was recorded under the same name from antarctic waters, north-west of the Gauss Station (Vanhöffen 1912*a*). In the Pacific it has only been found in the Bering Sea (Bigelow 1913). The localities where it was collected by 'Discovery', 'Discovery II' and 'William Scoresby' are within the same regions from which it was previously known, but they show that the species is much more common in the southern Atlantic and the Antarctic area than was previously known. Some of the specimens recorded as *Halicreas papillosum* by Thiel (1936) may have belonged to *B. brucei*.

Halitrephes maasi Bigelow 1909

(Text-fig. 19)

1909 *Halitrephes maasi* Bigelow, p. 146. Pl. 33, figs. 1–5, 7, 10; Pl. 45, fig. 13.
1912*a* *Halitrephes valdiviae* Vanhöffen, p. 384, in part.

OCCURRENCE: St. 89. 28. vi. 26. 34° 05′ 15″ S, 16° 00′ 45″ E. Net: TYF 1000(–0) m. 1 specimen.
St. 100. 4. x. 26. 33° 20′ S, 15° 18′ E to 33° 46′ S, 15° 08′ E. Net: TYFV 2500–2000 m. 1 specimen.
St. 256. 23. vi. 27. 35° 14′ S, 06° 49′ E. Net: TYF 850–1100(–0) m. 2 specimens.
St. 677. 27. iv. 31. 31° 16′ 15″ S, 29° 56′ 30″ W. Net: TYFV 2000–0 m. 1 specimen.
St. 893. 1–2. vi. 32. 49° 37′ 30″ S, 138° 35′ 18″ E. Net: N 100 B 260–100 m. 1 specimen.
St. 925. 1. vii. 32. 41° 20′ 30″ S, 167° 55′ 30″ E. Net: N 100 B 110–0 m. 2 specimens.
St. 963. 14. ix. 32. 52° 01′ 06″ S, 139° 13′ 12″ W. Net: N 100 B 320–128 m. 2 specimens.
St. 1586. 2. v. 35. 02° 39′ 24″ N, 50° 46′ 24″ E. Net: TYFB 1650–950 m. 1 specimen.
St. 1606. 31. x. 35. 26° 15′ 48″ S, 12° 18′ E. Net: TYFB 190–0 m. 1 specimen.
St. 1758. 1. v. 36. 31° 55′ 36″ S, 55° 06′ 30″ E to 31° 55′ S, 55° 05′ 06″ E. Net: N 450 B 1400–650 m. 2 specimens.
St. 2044. 23. iv. 37. 28° 38′ S, 01° 11′ 12″ W. Net: N 450 B 550–750 m. 2 specimens.
St. 2050. 26. iv. 37. 20° 26′ S, 02° 16′ W. Net: N 450 B 430–0 m. 1 specimen.
St. 2059. 30. iv. 37. 09° 11′ 24″ S, 05° 17′ 24″ W. Net: N 450 B 1900–1400 m. 1 specimen.
St. WS 127. 10. vi. 27. 40° 19′ S, 10° 06′ W. Net: N 70 V 1000–650 m. 2 specimens.

Moreover, the following specimens may with some doubt be referred to the same species:

St. 401. 22. v. 30. 37° 31′ 30″ S, 04° 33′ E to 37° 29′ S, 04° 39′ 30″ E. Net: TYFH 1200–1300 m. 1 specimen.
St. 702. 17. x. 31. 10° 59′ 18″ N, 27° 03′ 48″ W. Net: TYFB 236–0 m. 1 specimen.

Most of the localities are in the Atlantic Ocean, off the southern part of the west coast of Africa. Stns 1586 and 1758 are off the east coast of Africa. St. 893 is south of Australia, St. 925 near New Zealand, St. 963 between New Zealand and South America (text-fig. 19, p. 103).

Almost all the specimens are in a bad state of preservation; the jelly is very soft, the stomach is usually lost, and as a rule only a few of the radial canals can be traced, but in most specimens it was possible to state the approximate number of tentacles.

I have counted the radial canals and tentacles as follows:

Diam. (mm.)	10	15	28	30	30	40	46	47	47	60
Approx. no. of radial canals	16	16	?	20	16	20	?	?	?	?
No. of tentacles	?	32	52	50	54	70	54	64	76	70

The specimen from St. 401 is 55 mm. in diameter and has about 115 tentacles; it is possible, therefore, that it belongs to another species.

The best preserved specimen was taken by 'William Scoresby' at St. WS 127. The margin is bent somewhat inwards, the diameter of the umbrella 40 mm., the stomach 14 mm.; in half the circumference

10 radial canals are retained, they are broad and flat, with female gonads 9 mm. in length, situated about equi-distant from the stomach and the ring-canal, and containing large eggs. There are about 70 tentacles of very different sizes. Some few statocysts are retained.

In a small specimen from St. 925, 10 mm. in diameter, the stomach is 2·5 mm. wide, the mouth opening 1·8 mm.; it has 16 radial canals, but the tentacles could not be counted. In another specimen, from St. 1606, 30 mm. in diameter, the stomach is 9 mm., the mouth opening 5 mm.; there are 16 radial canals and about 54 tentacles.

Bigelow (1909) found three specimens of this species in the tropical East Pacific, but only one of them was in a fairly good condition, 55 mm. wide with 33 radial canals and about 70 tentacles. Two other species have been described: *H. valdiviae* was described, but not figured, by Vanhöffen (1912*a*, p. 384), several specimens being taken in the tropical parts of the Atlantic and Indian Oceans. According to the author, the species is distinguished from *H. maasi* by the number of radial canals which do not exceed 16, in so far as it was possible to count them. As mentioned above, the specimens in the Discovery collection, up to 40 mm. in diameter, have 16–20 radial canals. The number of tentacles in *H. valdiviae* varies as follows:

Diam. (mm.)	9	12	18	20	21	33	34	42	44	70
No. of tentacles	32	32	64	32	32	64	76	96	80	204

Specimens less than 44 mm. wide thus vary approximately within the same limits as the Discovery specimens of corresponding size; I therefore believe that they belong to the same species, and that none of them differ so much from *H. maasi* that a specific separation seems reasonable. The largest specimen observed by Vanhöffen, 70 mm. wide, had 204 tentacles; this very large number may perhaps justify the erection of a separate species. Provisionally, therefore, I think we may retain the name *H. valdiviae* for this single specimen, whereas all the others undoubtedly belong to *H. maasi*.

My description of *H. medius* (Kramp 1948*b*, p. 7, fig. 1) was based on a specimen taken by the Swedish Antarctic Expedition 1901–3, north-west of South Georgia; it was about 100 mm. in diameter with 30 radial canals and about 280 tentacles. There is the possibility, of course, that *H. maasi*, during continued growth, may produce this very large number of tentacles, though such an enormous increase does not seem very probable. Until further evidence is available, it therefore seems to me that we should retain *H. medius* as a separate species.[1]

Distribution. Tropical and antiboreal parts of the Atlantic, Indian and Pacific Oceans, mainly south of the equator, in the deep and intermediate layers.

Family Rhopalonematidae

Rhopalonema velatum Gegenbaur 1856

Occurrence: Stns 68, 69, 89, 100, 102, 247, 250, 254, 256, 273, 282, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 685, 686, 687, 688, 689, 690, 691, 692, 698, 699, 702, 703, 704, 705, 707, 708, 709, 710, 712, 714, 718, 847, 963, 1370, 1371, 1372, 1373, 1374, 1375, 1568, 1571, 1573, 1574, 1575, 1576, 1581, 1585, 1586, 1587, 1749, 1770. (For details of station positions, date, etc., see Table 1, p. 110.)

All the localities are within areas from which the species was known before.

With very few exceptions the medusae were taken in hauls passing through the upper water-layers; the only exceptions are at Stns 847 (N 100 B 270–196 m.) and 1575 (TYFB 800–550 m.).

The following species are synonyms of *R. velatum*: *clavigerum*, *coeruleum* and *polydactylum*, all described by Haeckel 1879, and *R. striatum* Maas 1893. *Rhopalonema funerarium* Vanhöffen 1902*b* is a distinct species.

[1] Since the above was written, I have seen numerous specimens of *Halitrephes* collected by 'Dana', and I am now convinced that *H. maasi* is the only existing species of the genus.

Distribution. *Rhopalonema velatum* is widely distributed and very common in the warm parts of all the oceans, including the Mediterranean. Its southern limit of distribution is approximately about 45° S in the Atlantic and Indian Oceans, and about 30° S in the Pacific. In the Atlantic it may occasionally penetrate as far north as off the west coast of Scotland, and it is recorded from the Gulf of Maine on the American coast. It belongs mainly to the upper layers, but may also be met with at considerable depths.

Rhopalonema funerarium Vanhöffen 1902

(Text-fig. 19)

1902*b* *Rhopalonema funerarium* Vanhöffen, p. 61. Pl. 9, fig. 2; Pl. 10, fig. 17; Pl. 11, fig. 31.
1910 *Rhopalonema coeruleum* Mayer, p. 380, in part.
1947 *Rhopalonema funerarium* Kramp, p. 14. Pl. 2, figs. 4–5.
1953 *Rhopalonema funerarium* Russell, p. 434. Text-figs. 285–6.

Occurrence: St. 100. 2. x. 26. 33° 20′ S, 15° 18′ E to 33° 46′ S, 15° 08′ E. Net: TYF 475(–0) m. 3 specimens.
St. 276. 5. viii. 27. 05° 54′ S, 11° 19′ E. Net: TYF 150(–0) m. 1 specimen.
St. 281. 12. viii. 27. 00° 46′ S, 05° 49′ 15″ E. Net: TYF 850–950(–0) m. 2 specimens.
St. 282. 12. viii. 27. 01° 11′ S, 05° 38′ E. Net: TYF 300(–0) m. 5 specimens.
St. 285. 16. viii. 27. 02° 43′ 30″ S, 00° 56′ 30″ W. Net: N 450 125–175(–0) m. 1 specimen.
St. 698. 13. v. 31. 12° 21′ 45″ N, 30° 07′ 30″ W. Net: TYFB 470–0 m. 2 specimens.
St. 700. 18. v. 31. 20° 21′ 30″ N, 22° 32′ 30″ W. Net: TYFB 2025–0 m. 1 specimen.
St. 1056. 4. xii. 32. 50° 18′ S, 37° 04′ 30″ W. Net: N 100 B 340–150 m. 1 specimen.
St. 2044. 23. iv. 37. 28° 38′ S, 01° 11′ 12″ W. Net: N 450 B 550–750 m. 2 specimens.
St. 2053. 27. iv. 37. 17° 45′ 42″ S, 02° 49′ 48″ W. Net: TYFB 900–550 m. 1 specimen.
St. 2059. 30. iv. 37. 09° 11′ 24″ S, 05° 17′ 24″ W. Net: N 750 B 1900–1400 m. 1 specimen.
St. 2061. 1. v. 37. 06° 36′ S, 06° 25′ 06″ W. Net: N 450 B 1900–1500 m. 1 specimen.
St. 2064. 3. v. 37. 00° 46′ 54″ S, 10° 11′ 30″ W. Net: N 450 B 1600–1050 m. 1 specimen.

Most of the localities are off the west coast of Africa, between about 20° N and 34° S. St. 1056 is north of South Georgia. Some of the specimens are in fairly good condition. The specimens vary in diameter between 9 and 18 mm. Thiel (1936, p.10) takes it for granted that this species is identical with *R. velatum*, but as demonstrated by me in a previous paper (Kramp 1947, p. 14) it differs from that species in several regards.

Distribution. This species is widely distributed in the deep layers of all the oceans, but it seems to be fairly rare. In the Pacific and Indian Oceans it has only been found in tropical waters, in the Atlantic it occurs as far north as west of Scotland and in the Gulf of Maine. It has frequently been recorded from the tropical Atlantic. The occurrence at St. 1056 is considerably farther south than has been known up to now (text-fig. 19, p. 103). It belongs to the deep and intermediate layers, but may occasionally be found at higher levels.

Pantachogon haeckeli Maas 1893

(Text-fig. 18)

1893 *Pantachogon haeckeli* Maas, p. 17. Pl. 1, fig. 2.
1902*b* *Pantachogon rubrum* Vanhöffen, p. 63. Pl. 9, fig. 9; Pl. 10, figs. 19, 20; Pl. 11, fig. 25.
1947 *Pantachogon haeckeli* Kramp, p. 19. Pl. 2, figs. 7, 8.
1953 *Pantachogon haeckeli* Russell, p. 440. Pl. 25, fig. 2. Text-figs. 290–2.

Occurrence: Stns 9, 68, 71, 76, 78, 85, 86, 87, 89, 100, 101, 114, 117, 138, 151, 256, 298, 300, 301, 304, 305, 313, 320, 325, 335, 344, 358, 391, 395, 407, 661, 666, 668, 671, 673, 675, 677, 696, 699, 700, 769, 1298, 1568, 1569, 1586, 1587, 1606, 1633, 1639, 1707, 1728, 1743, 1745, 1750, 1751, 1753, 1755, 1758, 1761, 1762, 1765, 1784, 1825, 1876, 1917, 1919, 1972, 1989, 1991, 2048, 2063, 2064, 2065. WS 29, WS 36, WS 44, WS 67, WS 110, WS 190. (For details of station positions, date, etc., see Table 1, p. 110, and text-fig. 18, p. 102.)

Many of the localities are in the waters west and east of Africa, from the Cape Verde Islands round the Cape of Good Hope to Somaliland, and in a line along about 32° S from South Africa almost to Australia, within which regions the species was previously known to be of common occurrence. It is also present in numerous localities in the South-West Atlantic, from which region there was only one previous record. A few specimens were taken north and north-west of South Georgia by the Swedish Antarctic Expedition (Kramp 1948*b*, p. 9), but the present collection shows that it is generally distributed and very common in this area. It was taken in numerous hauls round South Georgia and also over the whole area between 30° and 60° W. The southernmost locality was in the Weddell Sea at St. 1876 (58° 37·7′ S, 54° 54·4′ W). It also occurred in several localities along 30° W between latitudes 55° S and 30° S.

Of particular interest are the following localities: Stns 114, 117 and 1784 in the neighbourhood of Bouvet Island, St. 1633 south-east of Heard Island, St. 1728 at 53° 14·9′ S, 107° 02′ E, St. 1707 at 63° 36·9′ S, 129° 24·7′ E near the Antarctic Continent, and St. 1298 in the Pacific section of the Antarctic, about 69° S, 126° W. This is the first time this species has been recorded from the South Pacific, and the only reliable previous records from the Indian Ocean sector of the Antarctic ocean are those of Vanhöffen (1902*b*) of *P. rubrum* from between 55° 27′ S, 28° 59′ E and 64° 14′ S, 53° 30′ E. The map given by Thiel (1936, p. 26) is unreliable, because this author has united several different species under the name *P. rubrum*.

Distribution. *P. haeckeli* occurs in the deep and intermediate layers, and it is probably generally distributed in the deeper regions of all the oceans, except the arctic basins and the Mediterranean. It is common in the North Atlantic as far as the Wyville Thompson Ridge, and west of Greenland it may occasionally traverse the submarine ridge and penetrate into Baffin Bay. In the North Pacific it is common from Japan to the Bering Sea and off the northern part of the west coast of America between Alaska and Puget Sound, but it has not yet been recorded from the East Pacific farther south.

Colobonema sericeum Vanhöffen 1902

(Text-fig. 19)

1902*b* *Colobonema sericeum* Vanhöffen, p. 57. Pl. 9, fig. 1; Pl. 12, figs. 39–42.
1905 *Colobonema typicum* Maas, p. 53. Pl. 10, figs. 62–5.
1910 *Homoeonema typicum* Mayer, p. 385, in part.
1912*a* *Colobonema sericeum* Vanhöffen, p. 372.
1936 *Colobonema sericeum* Ranson, p. 152. Pl. 2, figs. 14–15.
1953 *Colobonema sericeum* Russell, p. 436. Pl. 25, fig. 1. Text-figs. 287–289.

Occurrence: 2. xi. 25. 6° 55′ N, 15° 54′ W. 28. x. 25, 13° 25′ N, 18° 22′ W. Stns 78, 81, 85, 86, 87, 89, 100, 101, 248, 256, 281, 296, 405, 407, 440, 677, 690, 700, 1569, 1575, 1600, 1602, 1604, 1741, 1743, 1747, 1750, 1751, 1753, 1754, 1755, 1757, 1758, 1759, 1762, 1765, 1766, 2031, 2033, 2035, 2036, 2044, 2047, 2057, 2059, 2061, 2063, 2064. (For details of station positions, date, etc., see Table 1, p. 110, and text-fig. 19, p. 103.)

In the Atlantic Ocean, this species was taken in numerous localities off the west coast of Africa, between Cape Verde and the Cape of Good Hope, and farther west towards South America, the southernmost locality was at St. 78, in 35° 18′ S, 19° 01′ W. It was also taken at most of the stations along latitude about 32° S, from South Africa almost to Australia, and in one locality (St. 1575) in the Mozambique Channel. The species was previously known from about the same regions, with the exception that Stns 677 and 690, about 30° W, are somewhat farther west than any other previous records from the southern Atlantic.

Colobonema sericeum is a bathypelagic medusa, and the majority of the present collections were made in the deep layers; but there are some few exceptions, of which the most remarkable are

Stns 1600 (470–0 m.) and 1602 (175–0 m.), both off the coast of Angola, where an upwelling of cold water from the deep layers takes place. This will be further discussed in the General Section.

Distribution. Widely distributed in the deep parts of the great oceans. In the eastern part of the North Atlantic it occurs as far north as off the south and west coasts of Iceland, in the western part off the Newfoundland Bank. It has never been found in the Mediterranean, but it seems to be generally distributed in the Atlantic basin as far south as a little beyond the latitude of the Cape of Good Hope. 'Discovery' found it in 35° S, and by 'Valdivia' it was taken in one locality in 42° S, 14° E, south-west of South Africa. It is also generally distributed in the Indian Ocean north of about 35° S. In the Pacific it has only been recorded from Japan and from the tropical eastern region. In contradistinction to most other bathypelagic medusae, this species does not approach the shelf of the Antarctic Continent; it seems to have a fairly distinct southern limit of distribution in about 35° or 40° S.

Sminthea eurygaster Gegenbaur 1856

1856 *Sminthea eurygaster* Gegenbaur, p. 245. Pl. 9, figs. 14–15.
1879 *Trachynema eurygaster* Haeckel, p. 260.
1879 *Marmanema mammaeforme* Haeckel, p. 262.
1910 *Sminthea eurygaster* Mayer, p. 383. Text-figs. 226–7.

Occurrence: St. 256. 23. vi. 27. 35° 14′ S, 06° 49′ E. West of Cape of Good Hope. Net: TYF 850–1100(–0) m. 2 specimens.
St. 282. 12. viii. 27. 01° 11′ S, 05° 38′ E. Gulf of Guinea. Net: TYF 300(–0) m. 1 specimen.

One of the specimens from St. 256 is in a good condition, 6 mm. wide, with well-preserved gonads close to the ring-canal. The specimen from St. 282 is somewhat shrunk, but in this specimen also the gonads are well preserved.

Distribution. Mediterranean; Bay of Biscay; near the Azores; Canary Islands; off the north coast of Brazil; in the surroundings of the Amirante and Chagos Islands in the Indian Ocean. Now found in two localities off the west coast of Africa.

Genus Arctapodema Dall.

The first two species of this genus were described by Vanhöffen (1902*b*, pp. 65 and 66) as *Homoeonema amplum* and *macrogaster*. Maas (1906*b*, p. 5) gave a new description and numerous figures of *H. amplum* and made it the type of a new genus, *Isonema*. This name being preoccupied, Dall (1907, p. 661) replaced it by *Arctapodema*. Mayer (1910, p. 387), however, retained the name *Homoeonema* (the great confusion concerning this name is discussed in Kramp 1947, pp. 14 *et seq.*).

In 1912*a* Vanhöffen added three new species to the genus: *Isonema antarcticum*, *australe* and *tetragonium*. Ranson (1936, pp. 156 *et seq.*) accepted the generic name *Arctapodema* and provisionally retained all of the five species, whereas Thiel (1936, p. 26) united them all, together with *Pantachogon scotti* Browne, with *Homoeonema platygonon* (*sensu* Browne). A new species, *Isonema najadis*, was described by Pell (1938, p. 926); it is undoubtedly identical with *Arctapodema album*.

With the exception of *A. album*, none of the species have been observed since they were described by Vanhöffen, but three species are represented in the Discovery collection: *amplum*, *antarcticum* and *australe*, and I am able to state that they are distinct species. I am inclined to think that *A. tetragonium* is identical with *amplum* (see below). Vanhöffen's (1902*b*) description of *A. macrogaster* was based on one badly preserved specimen (reconstructed in Pl. 10, fig. 22); it may possibly be identical with *A. australe*, but an identification of these two species is still uncertain.

With a slight alteration of the definition of '*Isonema*' as given by Maas, *Arctapodema* may be characterized as follows: Rhopalonematidae without a gastric peduncle; with urn-shaped stomach;

with gonads adjacent to the stomach; with eight narrow radial canals; with numerous tentacles, all alike, in a single row; with club-shaped marginal statocysts.

As a matter of fact, the position of the gonads is variable. In *A. australe* they are sac-shaped, situated in the proximal parts of the radial canals but distinctly separated from the stomach. In *A. antarcticum* they are restricted to the walls of the upper part of the stomach, whereas no gonads are found on the radial canals. If we knew only these two species, we should probably regard them as belonging to two different genera, but as demonstrated below, *A. amplum* and *tetragonium* may be regarded as transitional forms.

In *Arctapodema* the gonads are radially separated; in *Homoeonema*, which contains only one species, *platygonon* Browne, the gonads form a continuous band around the base of the stomach, extending outwards along the radial canals (see Kramp 1947, p. 17). There is good reason, therefore, to keep these two genera apart.

Arctapodema antarcticum (Vanhöffen 1912)

(Text-fig. 9)

1912*a* *Isonema antarcticum* Vanhöffen, p. 375. Text-figs. 8–9.
1936 *Arctapodema antarcticum* Ranson, p. 157.

Occurrence: St. 1718. 25. iii. 36. 64° 22′ 36″ S, 106° 33′ 18″ E. Off Knox Land, Antarctica. Net: TYFB 900–550 m. 1 specimen.

St. 1749. 24. iv. 36. 32° 04′ 06″ S, 77° 59′ 36″ E. Between South Africa and Australia. Net: TYFB 1050–600 m. 1 specimen.

St. 1838. 12. x. 36. 57° 10′ 12″ S, 30° 42′ 30″ W. East of the South Sandwich Islands. Net: TYF 70 B 750–250 m. 3 specimens.

St. 1917. 3. xii. 36. 53° 48′ 42″ S, 46° 27′ 42″ W. Near Shag Rocks. Net: TYFB 1400–1000 m. 1 specimen.

St. 1919. 4. xii. 36. 54° 02′ 54″ S, 42° 10′ 48″ W. West of Shag Rocks. Net: TYFB 1800–1300 m. 1 specimen.

The specimens have the following diameters: St. 1718: 15 mm.; St. 1749: about 13 mm.; St. 1838: 14, 14 and 16 mm.; St. 1917: 11 mm.; St. 1919: 16 mm. The tentacles could only be counted in two of the specimens (Stns 1718 and 1838), both had about 112 tentacles. The manubrium is cylindrical, and the gonads occupy the proximal one-third to one-half of the stomach; they are not ring-shaped as stated by Vanhöffen, they are interrupted in the four perradial corners of the stomach, so that there are four interradial gonads; this applies to female as well as male gonads. In all other regards the specimens agree perfectly with Vanhöffen's description and figure.

Distribution. Up to now this species has been known only from the neighbourhood of the Gauss Station, in about 90° E near the Antarctic Continent. It is now seen to have a far more extensive distribution in antarctic waters, and it has also been found in latitude 32° S in the Indian Ocean, about mid-way between South Africa and South Australia (see chart, text-fig. 9). It belongs to the deep water-layers.

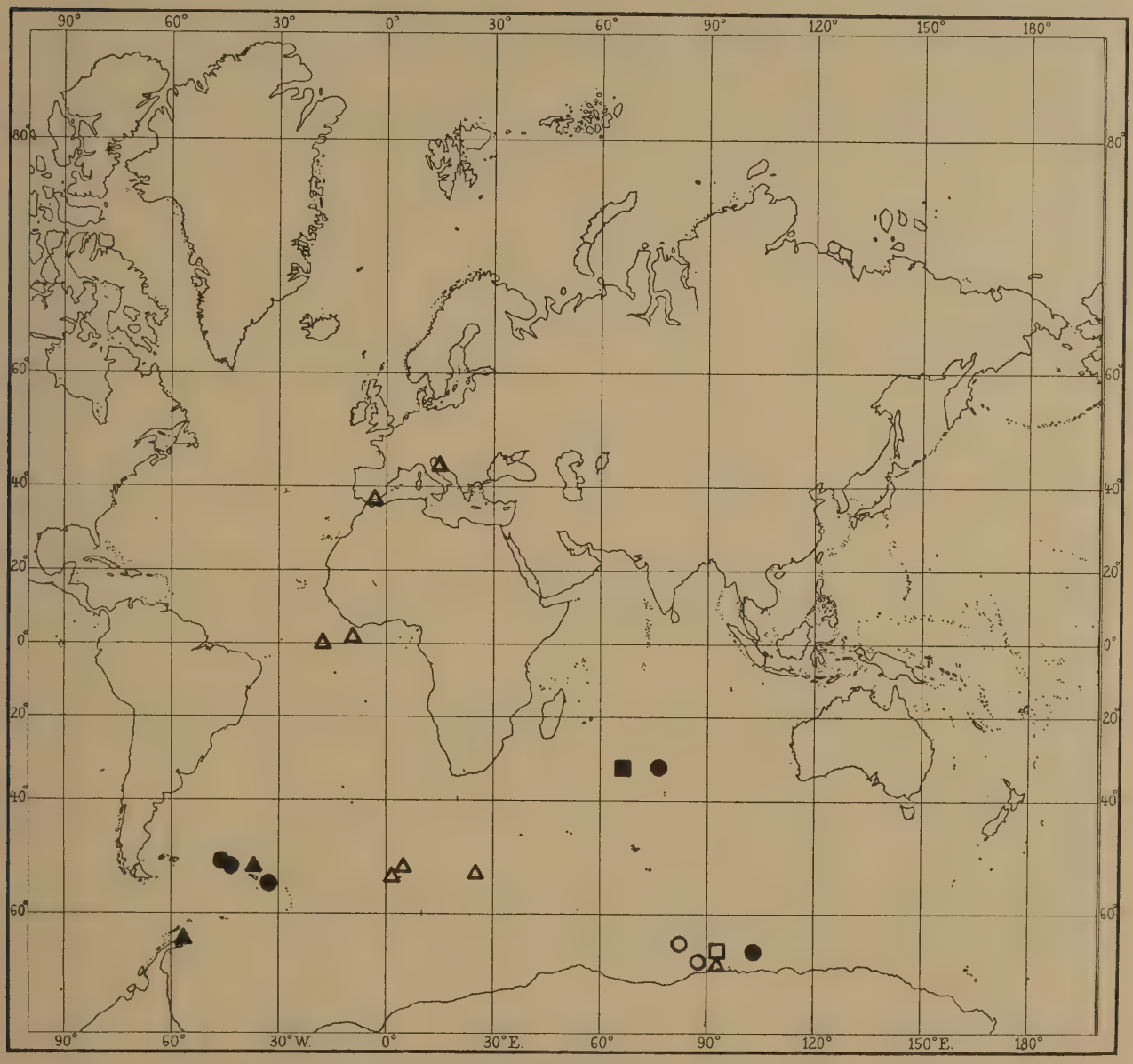
Arctapodema amplum (Vanhöffen 1902)

(Pl. V, fig. 4, text-fig. 9)

1902*b* *Homoeonema amplum* Vanhöffen, p. 65. Pl. 10, fig. 21; Pl. 11, figs. 24, 26, 27.
1906*b* *Isonema amplum* Maas, p. 5. Pl. 1, figs. 1, 2, 7; Pl. 2, figs. 8–12; Pl. 3, figs. 14–20.
1907 *Arctapodema amplum* Dall, p. 661.
1910 *Homoeonema amplum* Mayer, p. 387. Figs. 236–7.
1912*a* *Isonema amplum* Vanhöffen, p. 374. Text-figs. 4–7.
1913 *Pantachogon amplum* Bigelow, p. 44.
1936 *Homoeonema platygonon* Thiel, p. 26, in part.
1936 *Arctapodema amplum* Ranson, p. 158. Pl. 2, fig. 17.
1938 *Arctapodema najadis* Pell, p. 926.
1955 *Arctapodema amplum* Kramp, p. 273.

Occurrence: St. WS 160. 27. ii. 28. 53° 00′ S, 36° 52′ W. North of South Georgia. Net: N 70 V 500–250 m. 2 specimens.

St. WS 388. 16. ii. 29. 62° 55′ 30″ S, 57° 40′ W. Near the north point of Graham Land. Net: N 70 V 400–250 m. 1 specimen (for distribution see chart, text-fig. 9).



Text-fig. 9. Distribution of: *Arctapodema antarcticum* = ●, previous records = ○. *A. amplum* = ▲, previous records = △. *A. australe* = ■, previous records = □.

The specimen from St. 388 is only 4 mm. in diameter. The two specimens from St. 160 are 6 mm. wide, with about 96 tentacles. Their gonads present some features of considerable interest.

The gonads of *A. amplum* have been described and figured in different ways, and evidently their structure is variable. In the first specimen described by Vanhöffen (1902*b*) the stomach was very small, its base surrounded by eight almost globular gonads. According to Maas (1906*b*), who

examined several specimens, the young gonads first appear as eight small evaginations on the radial canals close to the stomach; later they are more or less completely divided into two lateral sacs. Their further development may proceed more or less irregularly, and the limits between the gonads and the eight radial diverticula of the upper portion of the stomach may be indistinct. In the largest specimen, 6·5 mm. wide, examined by Vanhöffen (1912*a*) the gonads are divided into two parts, 'von denen die obere der Wurzel der Radialkanäle anliegt, während die untere Partie mit zwei Aussackungen auf dem oberen achtfach gefallteten Teil des Magens ruht'. The accompanying text-figures show that the gonads of Vanhöffen's specimen were at an immature stage. According to Ranson (1936), who examined two specimens from the Mediterranean 7–8 mm. in diameter, the structure and position of the gonads are difficult to state precisely. In his specimens the gonads, issuing from the radial canals close to the stomach, have attained a considerable size; they may touch each other interradially and even fuse together.

In one of the present specimens (St. WS 160, 6 mm. in diameter) the manubrium is short and broad. Gonads (Pl. V, fig. 4) containing numerous large eggs are developed as eleven radial lobes from the upper surface of the stomach, very unequal in size and irregularly distributed, and, moreover, small additional sac-shaped gonads issue from the radial canals at a short distance from the stomach, usually in pairs. No additional gonads are developed on the radial canal above the largest of the gonadial lobes issuing from the stomach.

In the other specimen from the same locality, also 6 mm. wide, the structure is very similar, but the gonads are less developed. The specimen from St. WS 388 is young, 4 mm. wide; the stomach is short, its basal part has 16 radial folds, from which the gonads issue as irregular radial lobes; there are no additional gonads on the radial canals.

The paired, sac-shaped gonads on the proximal part of the radial canals in the specimens from St. WS 160 correspond to those described and figured by Maas in *A. amplum*; the gonadial lobes issuing from the basal wall of the stomach resemble the gonads of *A. tetragonium* (Vanhöffen 1912*a*, p. 377. Text-figs. 12–15). This medusa, which was up to 12·5 mm. wide, had four gonads, kidney-shaped, in the walls of the stomach adjacent to the subumbrella; in other respects the species was similar to *A. amplum*. Considering the irregularities observed in *A. amplum*, it seems very probable to me that *A. tetragonium* is only an aberrant form of *A. amplum*; it was found in the Atlantic Ocean near the equator within the area of distribution of *A. amplum*.

Since gonads may be developed in the stomach wall as well as on the radial canals in *A. amplum*, this species forms a connecting link between *A. antarcticum*, in which the gonads are restricted to the stomach walls, and *A. australe* in which the gonads are situated on the proximal parts of the radial canals. These three species may therefore be regarded as belonging to one genus, *Arctapodema*, in spite of the considerable difference between the two extremes.

Distribution. *A. amplum* occurs in the intermediate and deep layers of the Atlantic and Indian sectors of the Antarctic Ocean; in the tropical Atlantic; and in the Mediterranean.

Arctapodema australe (Vanhöffen 1912)

(Pl. V, figs. 5, 6, text-fig. 9)

1912*a* *Isonema australe* Vanhöffen, p. 376. Text-figs. 10–11.

1936 *Arctapodema australe* Ranson, p. 157.

Occurrence: St. 1753. 27. iv. 36. 32° 00′ 24″ S, 68° 50′ 54″ E. Between South Africa and Australia. Net: TYFB 2900–1400 m. 1 specimen (for distribution, see chart, text-fig. 9, p. 57).

This species was well described and figured by Vanhöffen. His only specimen was 23 mm. wide and 14 mm. high, with about 112 tentacles. The present specimen is only 7·5 mm. wide and 5 mm. high,

with about 96 tentacles; the jelly is soft and fairly thick; the stomach is short and broad, of a deep violet colour, its upper part with 16 radial folds; it is turned inside out (Pl. V, fig. 5). The eight gonads are almost globular, reddish-brown, of somewhat unequal size, somewhat pendent (Pl. V, fig. 6), but not elongated as in Vanhöffen's much larger specimen; they are placed near the base of the stomach, but distinctly separated from it. Vanhöffen describes the inner surface of the stomach as seen when the mouth is widely open; four ridges run from the four lips of the mouth, and between them are seen short, triangular valves and farther inwards some other similar structures. In the present specimen the stomach is still more widely open, so that the lips cannot be seen from below. The internal surface of the stomach shows eight broad swellings separated by deep, narrow furrows, each of the swellings with a median, flat, longitudinal ridge continued in a pointed, tenon-like prolongation towards the centre of the stomach cavity; these prolongations may correspond to the 'Blättchen' described by Vanhöffen. The swellings and radial folds of the stomach are not gonads; these are only developed on the radial canals. Apart from the minor details in the structure of the stomach wall, this specimen agrees so well with the description of *A. australe* that I do not hesitate to refer it to that species.

Distribution. Previously known only from the Gauss Station near the Antarctic Continent, in about 90° E; now also found farther north in the Indian Ocean, about midway between South Africa and South Australia, in the deep and intermediate layers.

Amphogona apicata sp.n.

(Pl. V, fig. 7)

Occurrence: St. 89. 28. vi. 26. 34° 05′ 15″ S, 16° 00′ 45″ E. West of Cape of Good Hope. Net: TYF 1000(–0) m. 1 specimen.
St. 102. 28. x. 26. 35° 29′ 20″ S, 18° 33′ 40″ E. West of Cape of Good Hope. Net: N 70 V 750–500 m. 2 specimens.
St. 1575. 24. iv. 35. 18° 33′ 12″ S, 41° 35′ 24″ E. Mozambique Channel. Net: TYFB 800–550 m. 2 specimens.
St. WS 22. 30. xi. 26. 53° 38′ S, 35° 35′ W. North of South Georgia. Net: N 70 V 1000–750 m. 2 specimens.
St. WS 70. 23. ii. 27. 51° 58′ S, 55° 42′ W. East of Falkland Islands. Net: N 70 V 1000–750 m. 2 specimens.

One of the specimens from St. 102, 4·5 mm. in diameter, is chosen as the *holotype*.

Description. Umbrella dome-shaped, as high as wide or slightly higher, diameter up to 7 mm., height up to 8 mm., with a distinct, bluntly conical, gelatinous apical projection, lateral walls thin. Velum broad. The stomach is mounted on a small gelatinous peduncle as long as one-sixth of the height of the bell cavity. Manubrium tubular, length up to one-third of the height of the bell cavity; in the contracted state it may be urn-shaped, almost concealing the peduncle. Mouth with four short, simple lips. Eight narrow radial canals. Gonads sac-shaped, pendent, on the radial canals, in or a little above the middle point of the canals; the gonads are usually of somewhat different size, but large and small gonads are not always regularly alternate. In each of the specimens examined, the gonads are of one sex. Ring-canal narrow. About 64 tentacles. Statocysts? Specimen colourless when preserved in formalin.

Remarks on specimens of different sizes:

Diam. 3 mm., height 4 mm. (St. 102). Only four gonads are developed, and they are not placed crosswise. About 5 tentacles per octant.

Diam. and height 3·5 mm. (St. WS 22). Eight gonads like small dots, a little above the middle of the canals. About 4 tentacles per octant.

Diam. and height 4 mm. (St. WS 22). Gonads in the middle of the canals, all with large eggs. The stomach is strongly contracted, short and broad, concealing the peduncle which is only seen as a small conical prolongation from the apical jelly into the cavity of the stomach. About 4 tentacles per octant. The specimen is well preserved.

Diam. and height 4 mm. (St. WS 70, two specimens). Gonads in the middle of the canals, sac-shaped, of different sizes, large and small not regularly alternate. About 6 tentacles per octant.

Diam. 4·5 mm., height 5·5 mm. (St. 102). Gonads a little above the middle of the canals, two of them, on adjacent canals, fairly large, pendent, with small eggs, the others like small dots. 7–8 tentacles per octant.

Diam. ?, height 5·5 mm. (St. 1575). Gonads in the middle of the canals, mutilated. About 10 tentacles per octant. Bell margin comparatively well preserved, but statocysts lost.

Diam. 7 mm., height 8 mm. (St. 89). Only four of the gonads are developed; they are small, arranged crosswise on the radial canals alternating with the sterile canals. The tentacles cannot be counted.

These details show that the development of the gonads proceeds irregularly; in small as well as large specimens only four gonads may be developed, and when there are eight in different stages of development, they are irregularly arranged.

This species differs from *Amphogona apsteini* by the higher form of the umbrella, the possession of a distinct apical knob, and particularly by the position of the gonads in the middle parts of the radial canals, whereas the gonads of *A. apsteini* are placed very near the ring-canal. *A. pusilla* Hartlaub has only 16 tentacles.

Distribution. Bathypelagic in the neighbourhood of the Falkland Islands and South Georgia, west of the Cape of Good Hope, and in the Mozambique Channel.

Tetrorchis erythrogaster Bigelow 1909

1909 *Tetrorchis erythrogaster* Bigelow, p. 124. Pl. 29, figs. 1–3.
1936 *Tetrorchis erythrogaster* Thiel, p. 39.

Occurrence: St. 1598. 23. x. 35. 07° 10′ 48″ S, 03° 31′ 18″ W. Gulf of Guinea. Net: TYFB 460–300 m. 1 specimen.
St. 2036. 17. iv. 37. 33° 45′ 30″ S, 15° 03′ 48″ E. West of Cape of Good Hope. Net: TYFB 2650–2200 m. 1 specimen.

The specimen from St. 1598 is badly preserved, but the margin is in a fair condition with 4 large and 16 small tentacles. The specimen from St. 2036 is 8 mm. in diameter, 7 mm. in height, and agrees well with Bigelow's description. The four gonads, however, are situated a little higher, in about the middle part of the radial canals. The distal quarter of the manubrium extends beyond the bell cavity. There are 4 large tentacles opposite the fertile radial canals; 16 very small tentacles are arranged at almost equal distances from each other, none of them are situated opposite to the sterile radial canals. According to Bigelow the sterile canals 'can hardly be traced at all as they approach the ring-canal'; in the present specimen they are distinct right out to the ring-canal. Like Bigelow I cannot see the statocysts. According to a note on the label the manubrium was 'a lovely purple red'.

Distribution. This characteristic species was originally described from the tropical East Pacific; Thiel records a specimen from the tropical Atlantic near Cape Verde. The present specimens were taken farther south, off the west coast of Africa. The species belongs to the deep and intermediate layers.

Persa incolorata McCrady 1857

1857 *Persa incolorata* McCrady, p. 104. Pl. 12, fig. 3.
1910 *Persa incolorata* Mayer, p. 408. Text-figs. 261–2.
1936 *Persa incolorata* Thiel, p. 43.
1951 *Persa incolorata* Picard, p. 20, fig.

Occurrence: St. 282. 12. viii. 27. 01° 11′ S, 05° 38′ E. Gulf of Guinea. Net: TYF 300(–0) m. 3 specimens.

The best preserved specimen is 2 mm. in diameter, 2·5 mm. high, with very thin walls and a small apical knob. There is a very short, conical gastric peduncle. The stomach is short, turned inside out, the four short, broadly rounded lips therefore protruding from its upper part. The musculature of the subumbrella is fairly strong. The eight radial canals are very narrow, and each of two opposite canals carries a short, oval gonad in its middle portion. The gonads are connected with the canals

by a very narrow opening; they are female and contain numerous small eggs. There were 6 tentacles per octant, but they are all broken off short. The statocysts are lost. Velum very broad.

The two other specimens are badly preserved. In one of them almost all the tentacles are lost, but some of the sensory clubs are retained. In the other specimen some of the tentacles are retained; they are long and each of them has a distinct terminal knob.

Distribution. This peculiar little medusa, which may attain a height of 3 mm., is recorded from North and South Carolina on the Atlantic coast of North America. Mayer (1910) found it at Naples in the Mediterranean, and according to Picard (1951) it is abundant near Marseilles and Villefranche-sur-Mer. It is identical with *P. lucerna* Haeckel from Corfu and *P. dissogonima* Haeckel from the Straits of Gibraltar. Thiel (1936) recorded it from several localities in the central and southern Atlantic between 19° N and 41½° S. The present specimens from the Gulf of Guinea do not increase the known area of distribution.

Crossota brunnea Vanhöffen 1902

(Text-fig. 17)

1902*b* *Crossota brunnea* Vanhöffen, p. 73. Pl. 9, figs. 11–13; Pl. 12, figs. 34–8 and 43–7.
1909 *Crossota brunnea* Bigelow, p. 135. Pl. 2, fig. 7; Pl. 45, fig. 9.
1912*a* *Crossota brunnea* Vanhöffen, p. 385.
1936 *Crossota brunnea* Thiel, p. 20, in part.

Occurrence: Stns 9, 71, 72, 76, 78, 85, 86, 89, 100, 101, 151, 239, 391, 395, 401, 666, 671, 675, 773, 1298, 1574, 1633, 1639, 1707, 1719, 1743, 1745, 1750, 1758, 1776, 1784, 1825, 1917, 1970, 1974, 2042, 2048, 2053, 2061. (For details of position, date, etc., see Table 1, p. 110, and text-fig. 17, p. 101.)

The most interesting of these localities is St. 1298 in the South Pacific, in about 69° S, 126° W, this being the first time that the species has been taken in the Pacific outside the tropical region. It is also of considerable interest that it was found in numerous localities in the south-western Atlantic, from which there was only one previous record, when some few specimens were found north-west of South Georgia by the Swedish Antarctic Expedition (Kramp 1948*b*, p. 10); 'Discovery II' even found it in the Weddell Sea. Some of the specimens are in beautiful condition.

I have previously discussed the species of *Crossota* (Kramp 1947, p. 21). It is very deplorable that Thiel (1936) united most of the species under the name *C. brunnea*; his map of distribution is therefore unreliable.

Distribution. Common in the deep layers in all the oceans south of the equator; as seen from the present collection it has a circumpolar distribution in the antarctic seas. In the Pacific it had not been found outside a comparatively small area off the coast of Peru (Bigelow 1909) and off southern Japan (Uchida 1947*b*, p. 338), the only record from the northern hemisphere. Now also found in the antarctic part of the Pacific.

Crossota alba Bigelow 1913

1913 *Crossota alba* Bigelow, p. 49. Pl. 3, figs. 9–12.

Occurrence: St. 2059. 30. iv. 37. 09° 11′ 24″ S, 05° 17′ 24″ W. Net: N 450 B 1900–1400 m. 1 specimen.
St. 2066. 5. v. 37. 04° 56′ 24″ N, 14° 46′ 42″ W. Net: N 450 B 1950–1550 m. 2 specimens.

It was a great surprise to find this medusa in the tropical Atlantic, but I do not hesitate to refer the specimens to this Japanese species, though all of them are destitute of gonads. The exumbrella is furrowed in the characteristic way peculiar to the genus, the structure of the manubrium, the number of tentacles and the colours agree perfectly with the description of *C. alba*.

The specimen from St. 2059 is 16 mm. in diameter and 12 mm. in height; the manubrium is 7 mm. long, tubular; the colour of the stomach is sometimes a deep violet, almost black, but in some lights it appears chocolate-brown; the mouth tube, which is 1 mm. long, is white, and the umbrella

is colourless. The tentacles cannot be counted exactly, their number has probably been about 120. One of the specimens from St. 2066 is 26 mm. wide and badly preserved; the other specimen is much larger, 42 mm. in diameter and 28 mm. in height. The manubrium is narrow, 16 mm. long, 2 mm. of which form the mouth tube. The stomach has the same colour as in the specimen mentioned above, though not quite as dark. Throughout the length of the stomach eight narrow, sharp lines are seen opposite to the eight radial canals, and there are eight fairly broad and flat longitudinal furrows in the intervening spaces. There are about 190 tentacles. The velum is 5 mm. broad. Bigelow's type specimen was about 22 mm. wide with 179 tentacles, 'that is [Bigelow says] only about one-third as many as in *C. brunnea* of about the same size'. The structure of the manubrium is quite different from that in *C. brunnea*.

DISTRIBUTION. Bigelow described two specimens from the east coast of Japan; Uchida (1947*b*, p. 339) gives a doubtful record from the same area, in which one wrecked specimen was found. Now also found in two localities off the west coast of tropical Africa .

Aglaura hemistoma Péron & Lesueur 1809

1910 *Aglaura hemistoma* Mayer, p. 398. Pl. 46, figs. 4–5; Pl. 49, figs. 3–7; Pl. 50, fig. 11. Text-figs. 250–1.

OCCURRENCE: St. 100. 2–4. x. 26. 33° 20′ S, 15° 18′ E to 33° 46′ S, 15° 08′ E. Net: TYF 0–5 m. 5 specimens. TYF 475(–0) m. 3 specimens.

St. 256. 23. vi. 27. 35° 14′ S, 06° 49′ E. Net: TYF 850–1100(–0) m. 1 specimen.

St. 282. 12. viii. 27. 01° 11′ S, 05° 38′ E. Net: TYF 300(–0) m. 9 specimens.

St. 690. 7. v. 31. 03° 17′ 45″ S, 29° 57′ 45″ W to 03° 20′ S, 30° 03′ 15″ W. Net: TYFV 250–0 m. 2 specimens. 1500(–0) m. 1 specimen.

St. 691. 8. v. 31. 00° 25′ 45″ S, 29° 56′ W. Net: TYFB 400–0 m. 8 specimens.

St. 692. 9. v. 31. 02° 02′ 15″ N, 30° 08′ W. Net: TYFB 350–0 m. 2 specimens.

St. 693. 10. v. 31. 02° 59′ 30″ N, 29° 59′ W to 02° 59′ 30″ N, 30° 04′ 45″ W. Net: TYFV 250–0 m. 1 specimen.

St. 701. 16. x. 31. 14° 39′ 18″ N, 25° 51′ 42″ W. Net: TYFB 242–0 m. 14 specimens.

St. 703. 18. x. 31. 07° 17′ N, 28° 01′ 54″ W. Net: TYFB 358–0 m. 2 specimens.

St. 704. 19. x. 31. 03° 37′ 42″ N, 29′ 14′ W. Net: TYFB 231–0 m. 14 specimens.

St. 705. 20. x. 31. 00° 03′ 24″ N, 30° 36′ 48″ W. Net: TYFB 150–0 m. 9 specimens.

St. 842. 3. iii. 32. 36° 04′ 48″ S, 13° 34′ 30″ E. Net: N 100 B 155–0 m. 1 specimen.

All these stations are in the Atlantic Ocean between the Cape Verde Islands and the Cape of Good Hope; the southernmost locality is St. 842, in 36° S, 13° E.

DISTRIBUTION. Generally distributed in the warm and temperate parts of all the oceans including the Mediterranean. In the Atlantic it penetrates as far north as the Bay of Biscay and the Gulf of Maine, in the Pacific as far as Japan and California. Its southern limit of distribution is in about 35° S in the Atlantic and Indian Oceans, and in about 20° S in the Pacific.

Family GERYONIDAE

Geryonia proboscidalis (Forskål 1775)

1910 *Geryonia proboscidalis* Mayer, p. 425. Pl. 53, figs. 1–3; Pl. 54, fig. 10. Text-fig. 282.

OCCURRENCE: St. 407. 12. vi. 30. 35° 13′ S, 17° 50′ 30″ E to 34° 57′ S, 17° 48′ E. Near Cape of Good Hope. Net: TYFB 220–0 m. 1 specimen.

St. 679. 29. iv. 31. 26° 06′ 30″ S, 30° 06′ 15″ W. Net: TYFB 300–0 m. 1 specimen.

St. 690. 8. v. 31. 03° 17′ 45″ S, 29° 57′ 45″ W to 03° 20′ S, 30° 03′ 15″ W. Net: TYFB 460–0 m. 1 specimen.

St. 692. 9. v. 31. 02° 02′ 15″ N, 30° 08′ W. Net: TYFB 350–0 m. 1 specimen.

St. 1374. 24. v. 34. 31° 46′ 36″ S, 29° 46′ 18″ E. South-East Africa. Net: TYFB 230–0 m. 1 specimen.

St. 1586. 2. v. 35. 02° 39′ 24″ N, 50° 46′ 24″ E. Net: TYFB 550–0 m. 1 specimen.

St. 2061. 1. v. 37. 06° 36′ S, 06° 25′ 06″ W. Gulf of Guinea. Net: N 450 B 1500–0 m. 1 specimen

The specimens from Stns 679, 1374 and 1586 are young stages, up to 12 mm. wide; the specimens from Stns 407 and 2061 are 38 mm. in diameter.

DISTRIBUTION. Widely distributed in the warm parts of all the oceans including the Mediterranean, approximately between 35° N and 35° S. The present collection adds nothing to the known area of distribution.

Liriope tetraphylla (Chamisso & Eysenhardt 1821)

1953 *Liriope tetraphylla* Russell, p. 419. Pl. 24, fig. 2. Text-figs. 275–82.

OCCURRENCE: Stns 89, 91, 100, 102, 273, 275, 280, 282, 468, 690, 691, 699, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 715, 1373, 1374, 1573, 1574, 1580, 1585, 1586, 2033. St. WS 657. (For details of position, date, etc., see Table 1, p. 110.)

Stns 89–102, 1373–4 and 2033 are west of the Cape of Good Hope; Stns 273–82 are off the west coast of tropical Africa; Stns 690–715 are on a line from the Cape Verde Islands along the east coast of South America to south-east of Buenos Ayres; Stns 1573–86 are off the east coast of Africa from the Mozambique Channel to Somaliland. All these localities are within the areas from which the species was known before, but St. 468 is considerably farther south, 54° 48′ S, 20° 41′ W, north-east of the South Sandwich Islands. St. WS 657 is in the Pacific on the coast of Peru.

DISTRIBUTION. Since it has been realized that all forms of *Liriope* belong to one species, we may state that it is generally distributed in the warm parts of all the oceans, approximately between 40° S and 45° N. Now also found farther south in the Atlantic.

NARCOMEDUSAE

Family AEGINIDAE

Aegina citrea Eschscholtz 1829

1829 *Aegina citrea* Eschscholtz, p. 113. Pl. 11, fig. 4.
1829 *Aegina rosea* Eschscholtz, p. 115. Pl. 10, fig. 3.
1879 *Aegina rhodina* Haeckel, p. 338. Pl. 20, figs. 11–13.
1908 *Aegina lactea* Vanhöffen, p. 50. Pl. 7, fig. 3.
1908 *Aegina brunnea* Vanhöffen, p. 51. Pl. 7, fig. 4.
1909 *Aegina alternans* Bigelow, p. 74. Pl. 17, fig. 1.
1953 *Aegina citrea* Russell, p. 467. Pl. 28, fig. 1. Text-figs. 308–10.

OCCURRENCE: Stns 76, 78, 100, 102, 151, 270, 276, 282, 290, 291, 298, 407, 677, 690, 697, 1370, 1371, 1374, 1575, 1749, 2047, 2053, 2057, 2064, 2070. (For details of position, date, etc., see Table 1, p. 110.)

Most of these localities are in the Atlantic Ocean from the coast of Portugal (St. 2070) to South Georgia (St. 151), but the species was also taken in the area south of Madagascar and farther east in the Indian Ocean (St. 1749). All the localities are inside the regions, from which the species was known before. It was taken at very different depths, e.g. at St. 100, west of the Cape of Good Hope, in hauls from 5–0 m. as well as from 1000–900 m.

The number of tentacles and marginal lappets was counted in 60 specimens with the following results:

No. of tentacles	3	4	5	6
No. of specimens	1	49	9	1

DISTRIBUTION. *Aegina citrea* has its main distribution in the warm and temperate parts of the oceans, but may also occasionally be carried as far north as the south coast of Iceland and southwards to the neighbourhood of South Georgia. In cold areas it only occurs in deep water, but in the warm areas it may be met with at the surface, though there also it frequently occurs in the deep and intermediate layers.

Aeginura grimaldii Maas 1904

1904 *Aeginura grimaldii* Maas, p. 38. Pl. 3, figs. 19–28.
1905 *Aeginura weberi* Maas, p. 77. Pl. 11, fig. 73; Pl. 12, fig. 76; Pl. 14, figs. 90–9.
1936 *Aeginura lanzerotae* Thiel, p. 86. Fig. 18.
1953 *Aeginura grimaldii* Russell, p. 472. Text-figs. 311–12.

Occurrence: St. 287. 19. viii. 27. 02° 49′ 30″ S, 09° 25′ 30″ W. Net: TYF 800–1000(–0) m. 1 specimen.
St. 298. 29. viii. 27. 13° 01′ 45″ N, 21° 34′ 45″ W. Net: TYF 900–1200(–0) m. 1 specimen.
St. 1580. 27. iv. 35. 08° 44′ 36″ S, 41° 50′ 18″ E. Net: TYFB 1300–750 m. 1 specimen.
St. 1585. 1. v. 35. 00° 06′ S, 49° 45′ 24″ E. Net: TYFB 1400–700 m. 2 specimens.
St. 1587. 3. v. 35. 06° 05′ N, 52° 00′ E. Net: TYFB 1250–800 m. 2 specimens.
St. 1600. 25. x. 35. 12° 43′ 18″ S, 00° 20′ 12″ E. Net: TYFB 400–330 m. 2 specimens.

Stns 287, 298 and 1600 are off the west coast of Africa, and Stns 1580, 1585 and 1587 off the east coast between Zanzibar and Somaliland. The species was previously known from the same areas.

Distribution. Widely distributed in the deep layers of all the oceans, except in the Mediterranean and in arctic seas.

Solmundella bitentaculata (Quoy & Gaimard 1824)

Occurrence: Stns 17, 100, 102, 107, 151, 270, 275, 276, 282, 303, 304, 305, 306, 311, 313, 319, 320, 321, 323, 325, 334, 335, 336, 337, 342, 343, 344, 353, 354, 355, 356, 357, 358, 589, 661, 690, 1370, 1373, 1606. WS 30, WS 44, WS 54, WS 67, WS 69, WS 139, WS 140, WS 141, WS 151, WS 160. (For details of position, date, etc., see Table 1, p. 110.)

All these localities are south of the equator, several of them are off the west and south coasts of Africa, one (St. 690) is near Cape San Roque in Brazil. Moreover, the species was taken in numerous localities in the area between the South Sandwich Islands and the Falkland Islands, and it was found in one locality west of Graham Land (St. 589). The species has been recorded from all these regions.

This well-known and widely distributed medusa was previously known to occur at very different depths; as far as the present collection is concerned the bathymetrical distribution may be summarized as follows:

Approx. depth of hauls (m.)	100–0	250–100	500–250	750–500	1000–750
No. of hauls	10	15	26	6	3

Accordingly the species may be found everywhere between the surface and depths of about 1000 m., though it seems mainly to occur between 100 and 500 m.

Distribution. Widely distributed in all the great oceans, particularly common in the southern hemisphere.

Family Solmaridae *sensu* Bigelow 1909

Narcomedusae without gastric pockets, the genital products being developed either as thickenings or as diverticula in the oral wall of the central stomach; with or without peripheral canals and otoporpae.

This is the definition of the family given by Bigelow (1909, p. 81) as distinct from the Cuninidae and Aeginidae, and I fully agree with this distinction. In a subsequent paper (1918, p. 394) Bigelow referred to the family under the headline: Solmaridae Haeckel, *sensu* Maas 1904, Bigelow 1909, Mayer 1910; but the diagnosis given by Maas ('Narcoméduses à antimères nombreux, sans nombre précis; système entodermique simple, sans canaux périphériques') would exclude the genus *Pegantha*.

The family comprises two genera: *Solmaris* Haeckel and *Pegantha* Haeckel. In 1918 (p. 394) Bigelow was inclined to regard *Polycolpa* Haeckel as a third genus distinct from *Pegantha*; I have recently (Kramp 1955, p. 278) expressed the opinion that the genus *Polycolpa* should be abandoned.

Genus **Pegantha** Haeckel

The diagnosis of this genus given by Bigelow (1909, p. 83) is as follows: 'Solmaridae with canal system and otoporpae; the gonads forming diverticula of the margin of the oral gastric wall. 8–32 tentacles'. Apart from the number of tentacles, which may amount to 40, I agree with this definition. It was slightly altered by Bigelow (1918, p. 394): 'Solmaridae with peripheral canal-system (at least in one generation), and with otoporpae; with gonads localized at the edge of the stomach, as numerous as, and in the radii of, the marginal lappets.' In some cases, however, the interradial sexual pockets are combined with an annular gonad, and in young specimens no interradial pockets are developed.

The genus *Pegantha*, as here defined, conforms with the entire family Peganthidae Haeckel (1879, p. 323): 'Narcomedusen ohne Radial-Canäle und ohne Magentaschen in der Subumbrella; aber mit einem Festoncanal (oder einem Ringkanal, der einen Kranz von getrennten Lappencanälen bildet); mit Otoporpen oder Hörspangen an der Basis der Hörkölbchen.' The family was divided into four genera, exclusively according to the structure of the gonads: *Pegasia* Péron & Lesueur 1809, *Polyxenia* Eschscholtz 1829, *Polycolpa* Haeckel 1879, and *Pegantha* Haeckel 1879. There is no reason whatever to keep these genera apart, and the question then arises, which generic name should be preferred. Bigelow (1940, pp. 303–4) has discussed this; he retained the name *Pegantha*, but with the addition: 'Should it prove, in the future, that the gonads must be discarded here, as a generic character, the name *Pegasia* (or if not *Pegasia*, then *Polyxenia*) will have priority.' It seems to me, however, that Mayer (1910, p. 441) has settled the question by his remark: 'The names *Pegasia* and *Polyxenia* are older than *Pegantha*, but they are so hopelessly confused through vague and inaccurate description that I believe it will be necessary to allow them to lapse into oblivion.' It also seems to me that an identification of Haeckel's three species of *Pericolpa* remains doubtful; none of them have been found again, and though a full description of the only specimen of *P. forskali* is given in the Challenger Report (Haeckel 1881) with several figures, an examination of fresh material is necessary to prove the correctness of his observations. On the other hand, Haeckel's genus *Pegantha* contains a number of well-described species, and I prefer, therefore, to retain the name *Pegantha*.

Haeckel's 'Peganthidae' comprised 16 species. Within each of his four 'genera' the species are characterized by: external shape of the umbrella, number and shape (outline) of the marginal lappets, shape of the gonads, number of marginal sensory clubs and otoporpae; but no attention is paid to the length of the otoporpae, and the conformation and width of the peripheral canals are entirely disregarded.

From time to time no less than 29 species have been referred to *Pegantha*. A provisional revision was attempted by Bigelow (1918, pp. 394 ff.), but, as pointed out by this author himself, larger series of specimens are required to obtain reliable results. The present collection contains a considerable number of specimens, but a satisfactory preservation of these delicate medusae requires very careful handling of each specimen. As a matter of fact, I do not think a successful revision of this and other groups of Narcomedusae will be possible, until a specialist gets an opportunity to study them immediately after they are brought up from the sea and picked out from the mass of crustaceans and pteropods and other animals contained in the plankton samples. The following revision of the species of *Pegantha* should therefore be accepted with due reservations.

Most of the specimens of *Pegantha* in the Discovery collections are in a rather poor condition, but some tolerably well-preserved specimens have enabled me to point out certain distinctive features, which seem to be characteristic of the different species and may be recognized even in fairly young stages and in more or less mutilated specimens. Five species are represented in the collection, and I refer them to five species which have previously been described in a recognizable way, doing away

with all doubtful synonyms. The five species are: *triloba* Haeckel, *martagon* Haeckel, *laevis* H. B. Bigelow, *clara* R. P. Bigelow, and *rubiginosa* Kölliker, which is transferred from the genus *Cunina*. Beside these only two species, *'Polycolpa' forskali* Haeckel and *Pegantha magnifica* Haeckel, may possibly be valid species, providing the descriptions are correct, and if so the genus *Pegantha* comprises altogether seven species.

The following forms, which were referred to *Pegantha* by Mayer (1910), are unrecognizable: *Foveolia diadema* Péron & Lesueur 1809 (*Polyxenia diadema* Haeckel), tropical Atlantic; *Aequorea punctata* Quoy & Gaimard 1824 (*Solmaris punctatus* Haeckel), Hawaii Islands; *Polyxenia cyanostylis* Eschscholtz 1829 and Haeckel 1879, Atlantic Ocean; *Polyxenia cyanolina* Haeckel, Indian Ocean; *Solmoneta aureola* Haeckel, Red Sea; *Solmaris godefroyi* Haeckel, Samoa Islands; *Solmaris weberi* Haeckel, tropical Pacific.

Aequorea cyanogramma Quoy & Gaimard 1824 (*Polyxenia cyanogramma* Haeckel) must likewise be abandoned, though attempts have been made to revive it (Vanhöffen 1908, Ranson 1949).

Medusa mollicina Forskål 1775 (Mediterranean), *Pegasia dodecagona* Péron & Lesueur 1809 (South Atlantic), and *Polycolpa zonaria* Haeckel 1879 (Mediterranean) may possibly be identical with *Pegantha martagon* Haeckel as suggested by Bigelow (1918), but it seems very doubtful.

Pegantha biloba Haeckel (Sandwich Islands), *P. quadriloba* Haeckel (tropical Atlantic), *P. pantheon* Haeckel (Philippine Islands), and *Pegasia sieboldii* Haeckel (tropical Atlantic) are probably identical with *P. triloba* Haeckel. *Pegantha dactyletra* Maas 1893 (central Atlantic) is suggested by Bigelow (1918) as possibly identical with *P. laevis*; it rather seems to me to belong to *P. triloba*.

Solmoneta lunulata Haeckel (Canary Islands) is a doubtful synonym of *Pegantha clara* R. P. Bigelow, but too doubtful for a safe identification.

The description of *Solmaris* sp. Browne 1916 (Chagos Archipelago), which is designated by Bigelow (1918) as 'a typical *Polycolpa*', was based on young stages which may have belonged to some species of *Pegantha*.

Undoubted synonyms are: *Pegantha simplex* Bigelow 1904 (= *P. martagon*), *Solmaris insculpta* Mayer 1906 (= *P. triloba*), and *Pegantha smaragdina* H. B. Bigelow 1909 (= *P. clara* R. P. Bigelow 1909).

My studies of the numerous specimens of *Pegantha* in the Discovery collections and additional observations of some fairly well-preserved specimens from the 'Atlantide' Expedition, off the west coast of Africa, have led me to the following conclusions as to the structural features which may serve as characteristics for identification of the species.

Umbrella. It may be of specific importance whether the umbrella is highly vaulted or more or less flattened, if the preservation is tolerably good, but frequently the shape cannot be relied on. In *P. triloba* the sculpture of the exumbrella is characteristic, and the gelatinous substance is particularly rigid. In species with a predominantly smooth surface, if the otoporpae seem to be deposited on elevated ridges, it is merely due to casual contraction.

Shape of the marginal lappets. It may be of importance whether the lappets are long or short in proportion to their width. The relation between length and width varies according to the state of contraction and preservation, but in extreme cases it may be a reliable character. The same applies to the outline whether pointed, rectangular, rounded, or pentagonal, etc.

The gonads, which, of course, are undeveloped in young specimens, may sometimes have a characteristic structure (especially in *P. triloba*); but their appearance is not merely dependent on the degree of development, I have also found that a strong contraction in a circular direction may produce foldings which are absent when the umbrella is flatly dilated.

The number of tentacles and lappets is an important specific character, though it is somewhat

variable in each species. In *P. clara* the number increases considerably with the age of the individual; especially in middle-sized specimens, several of the tentacles are usually smaller than the others, sometimes even almost regularly alternating with the fully developed tentacles. The same applies in a lesser degree to *P. laevis*. In the other species the full number is usually attained in young stages.

The NUMBER OF OTOPORPAE is likewise an important character; it is somewhat variable in each species, but apparently it increases only slightly with age. Their LENGTH is very characteristic, but has been utterly disregarded in the older literature. Unfortunately in badly preserved specimens the otoporpae are frequently more or less destroyed, so that it is difficult or even impossible to see them. Sometimes the sensory clubs are better preserved than the otoporpae, but they do not seem to be of use in the identification of species.

The WIDTH OF THE PERIPHERAL CANALS is a character of great importance for distinction between the species; it is rarely mentioned in the descriptions in the literature.

In my attempts to identify the numerous specimens of *Pegantha* in the Discovery collections, I proceeded in the following way. I first looked out for well-preserved specimens, which might serve for a provisional orientation, and then the samples were picked out at random regardless of their geographical origin. In each sample every specimen was measured, the tentacles counted, the number of sensory clubs and length of otoporpae determined as far as possible, and notes made on the shape of the umbrella, the softness or rigidity of the gelatinous substance, the outline and relative length of the marginal lappets, the width of the peripheral canals, and the conformation of the interradial diverticula and the gonads if they had attained a degree of development which made a description possible. All these observations were written on labels which afterwards were arranged in groups according to the various characters. Some few specimens could immediately be separated as belonging to *P. triloba*, and one agreed perfectly with *P. rubiginosa*. The remaining specimens, by far the most numerous, turned out to represent three well-defined types which could be referred to the three species *martagon*, *laevis* and *clara*, as described in Bigelow's papers after 1909. When in the end I marked the localities on maps, I found that all these three species occurred in tropical and subtropical seas, and that all the specimens taken south of latitude 50° S had been determined as *P. martagon*.

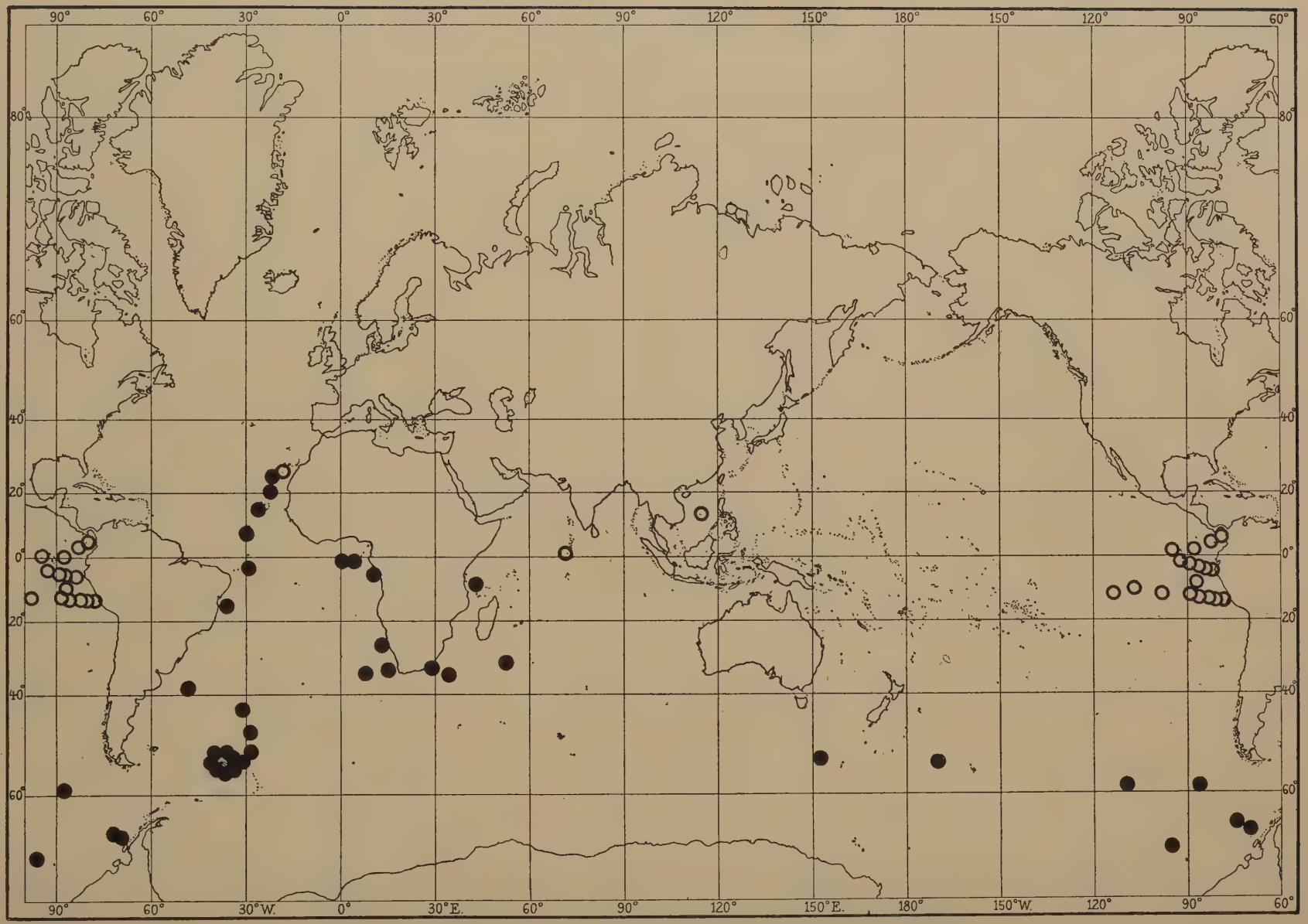
Pegantha martagon Haeckel 1879

(Plate VI, fig. 1, text-fig. 10)

1879 *Pegantha martagon* Haeckel, p. 333. Pl. 19, figs. 4–7.
1904 *Pegantha simplex* Bigelow, p. 260. Pl. 5, figs. 19–20.
1909 *Pegantha martagon* Bigelow, p. 83. Pl. 18, figs. 1–8.
1910 *Pegantha martagon* Mayer, p. 443. Text-figs. 195, 196.
1918 *Pegantha martagon* Bigelow, p. 395.
1940 *Pegantha martagon* Bigelow, p. 308.
1955 *Pegantha martagon* Kramp, p. 277.

OCCURRENCE: Stns 87, 100, 129, 133, 139, 276, 282, 284, 319, 344, 569, 593, 595, 663, 665, 667, 671, 690, 697, 700, 701, 709, 715, 903, 948, 972, 976, 1374, 1568, 1574, 1581, 1606, 1759, 2067. WS 28, WS 35, WS 63, WS 181, WS 186, WS 187, WS 283, WS 286. (For details of position, date, etc., see Table 1, p. 110.)

Stns 903, 948, 972 and 976 are in the South Pacific between 50° S and 60° S; Stns 569, 593 and 595 are in the antarctic area west of Graham Land; Stns 120, 133, 139, 319, 344 and 665 and all the 'William Scoresby' stations are in the neighbourhood of South Georgia, 667 and 671 somewhat farther to the north-east. Stns 1374, 1568, 1574, 1581 and 1759 are off the east coast of Africa between about 35° S and 8° S. The other stations are scattered on both sides of the Atlantic Ocean between about 39° S and 24° N (St. 2067 between the Cape Verde and the Canary Islands) (see chart, text-fig. 10).



Text-fig. 10. Distribution of *Pegantha martagon*. New records= ●, previous records= ○.

The only previous record from the Atlantic was near the Canary Islands, where 32 specimens were taken by the 'Atlantide' Expedition (Kramp 1955).

Apparently the species occurs in the upper layers. On some few occasions (in the South Atlantic and the South Pacific) it was taken in vertical hauls between about 300 m. and 100 m., but the majority of the other hauls were made from various depths to the surface. At St. 100, near the Cape of Good Hope, several specimens were taken in the surface 5 m.

Remarks on the morphology. In well-preserved specimens the central mass of jelly is usually thick and fairly highly vaulted, smooth; an indication of keels may occasionally be present below the otoporpae, but never continued above these latter. The ventral wall of the stomach is sometimes so strongly contracted that the mouth is a small opening. The interradial pockets, in which the gonads are developed, are usually quite simple, flatly rounded, rarely hemispherical, occasionally slightly folded, forming two or three short lobes. They may sometimes be discerned in specimens only 8–11 mm. in diameter, but frequently no traces of pockets are seen, even in much larger specimens, especially if the state of preservation is bad. When the gonads are particularly well developed, they are not restricted to the interradial pockets, but constitute a continuous folded band along the entire outline of the stomach, comprising the interradial pockets as well as the radial incurvations in the tentacular radii. The marginal lappets are usually about as long as broad, square or evenly rounded, rarely pentagonal or semi-circular. Their relative length is not merely dependent on the state of contraction, but also to some extent on the number of lappets, being somewhat elongated when there are many, short when there are few; in one specimen, 16 mm. in diameter with only seven tentacles, the lappets were only half as long as broad. The number of marginal clubs on the lappets is somewhat variable; sometimes there are only 3, and occasionally I have counted as many as 9 or 10 on each lappet, but as a rule there were 5 or 7, almost always an odd number. The otoporpae are short and narrow, about twice as long as the width of the transverse portion of the peripheral canal. The number of tentacles varies between 7 and 17 (see below).

The conformation of the peripheral canals is very characteristic and may be recognized even in mutilated specimens (Pl. VI, fig. 1). The transverse portion along the external edge of the lappet is fairly narrow, the lateral portions along the peronia are considerably broader, especially in their proximal parts, tapering in width towards the external margin. When measured mid-way between the basis and the external edge of the lappet, each canal is about one-fifth as wide as the entire lappet. In this respect *P. martagon* differs distinctly from *P. laevis* and *P. clara*.

In the present collection 85 specimens could be measured, varying in diameter between 3 mm. and 30 mm. The number of tentacles in specimens of different sizes will be seen from the following table:

Average diameter (mm.)	No. of tentacles: Width of variation	No. of tentacles: Average number	No. of specimens examined
4·5	8–12	9·5	4
8·3	8–14	11·1	21
13·1	9–17	12·3	24
18·0	7–17	12·1	23
23·7	11–16	12·8	9
27·5	10–16	13·5	4
Total	7–17	11·9	85

It appears from these figures that within each size-group the variation in number of tentacles is rather considerable, but each specimen attains its final number of tentacles at an early stage of development, and only occasionally one or two are added later on. The number of 8 tentacles was found

only in small individuals 3–6 mm. in diameter, 9 were found in specimens up to 19 mm. wide, 10 in specimens between 5 mm. and 27 mm. The smallest specimen with as many as 16 tentacles was 12 mm. wide, and the same number was counted in a particularly large specimen, 30 mm. in diameter. The number of tentacles most frequently met with was 12; it was found in 32 of the 84 specimens examined.

DISTRIBUTION. *Pegantha martagon* was first described from the China Sea; Bigelow records it from the Maldive Islands in the Indian Ocean (1904, as *P. simplex*) and from numerous localities in the tropical East Pacific (1909 and 1940). Recently recorded from the neighbourhood of the Canary Islands (Kramp 1955). In the British Museum (Nat. Hist.), London, I found 5 specimens of *P. martagon*, collected in 35° 00′ S, 46° 36′ E, south-east of Africa, 29. iv. 1937 by A. Seligman. The Discovery collections show that it is widely distributed in the tropical and subtropical Atlantic and the western part of the Indian Ocean, whence it penetrates southwards into subantarctic seas, where it has a circumpolar distribution.

Pegantha laevis H. B. Bigelow 1909

(Plate VI, fig. 2, text-fig. 11)

1909 *Pegantha laevis* Bigelow, p. 97. Pl. 16, fig. 1; Pl. 20, figs. 4–6; Pl. 27, figs. 1–7.
1910 *Pegantha laevis* Mayer, p. 444.
1918 *Pegantha laevis* Bigelow, p. 396.
1949 *Pegantha cyanogramma* Ranson, p. 135.
1950 *Pegantha laevis* Berrill, p. 301. Fig. 4N–L.
1955 *Pegantha laevis* Kramp, p. 279.

OCCURRENCE: Stns 100, 670, 671, 677, 701, 718, 1370, 1568. (For details of position, date, etc., see Table 1, p. 110.) Stns 1370 and 1568 are off the south-east coast of Africa, St. 701 is near the Cape Verde Islands; the others are in the southern Atlantic between the Cape of Good Hope and Patagonia in the southern part of South America (see chart, text-fig. 11).

The collection gives very little information on the bathymetrical distribution of this species. At St. 100, near the Cape of Good Hope, it was taken partly in the surface 5 metres, partly in hauls 550–450 m. and 2500–0 m. In all the other localities the nets were hauled from more or less deep layers to the surface. All previous finds are from the upper layers.

REMARKS ON THE MORPHOLOGY. One of the most characteristic features of this species is the great width of the peripheral canals. The umbrella is usually somewhat flattened, the surface completely smooth, jelly generally rather soft. The interradial pockets with the gonads may be simple, sac-shaped or bean-shaped, but when further developed they are irregularly lobed; in the largest specimen observed (diam. 44 mm. St. 671) each gonad has 4–5 lobes of different sizes. The marginal lappets are usually almost quadrate with rounded corners, occasionally they are somewhat pointed or pentagonal. Marginal sensory clubs could only be counted in some few specimens and then only in some few of their lappets; the number was sometimes five, sometimes seven. The otoporpae were usually shorter than the width of the transverse portion of the peripheral canals, but sometimes a little longer.

The peripheral canals are always very broad, especially their lateral portions along the peronia, and of nearly the same width from their base towards the end of the lappet (Pl. VI, fig. 2); as a rule they are more than one-fourth as wide as the entire lappet, and sometimes the space between them is narrower than the canals. Even badly preserved specimens may be specifically identified by this character.

Larvae, as they are described by Bigelow (1909, p. 99), were found in the peripheral canals of two specimens from St. 1568, 17 mm. and 25 mm. in diameter; in these specimens no gonads were developed.

Text-fig. 11. Distribution of *Pegantha laevis*. New records = ●, previous records = ○.

In most of the specimens the marginal lappets are of equal width and the tentacles of equal size, but occasionally two neighbouring lappets are narrow, indicating that they have newly arisen by the longitudinal division of one of normal width, and the tentacle between them is smaller than the others. The smallest specimen observed (St. 718) is only 10 mm. in diameter; it has 17 tentacles, but evidently this number had recently been attained, since several of the tentacles are much smaller than the others; in one specimen (St. 100), 16 mm. wide with 17 tentacles, several of the lappets are broad with a median incurvation carrying a very small tentacle resembling Bigelow's (1909) fig. 4 on Pl. 20. An abnormal development has taken place in a specimen, 28 mm. wide (St. 100); its total number of tentacles cannot be stated, but has exceeded 18; most of the tentacles are of equal size and equally spaced, but in one part of the circumference 8 tentacles of very different sizes are placed more or less closely together separated by narrow lappets.

Among 17 specimens observed, the tentacles could be counted in 13 with the following results:

Diam. (mm.)	No. of tentacles	No. of specimens examined
10	17	1
15–20	14–25, average 17·8	9
21	17	1
30	16	1
33	15	1
40	17	1
44	26	1

These figures show that as a rule the specimens attain their final number of tentacles and lappets at an early stage, but occasionally an additional number is developed during further growth of the individual.

I have been able to examine the specimen collected in the central part of the Atlantic by 'Mercator' and considered by Ranson (1949, p. 135) to belong to *Pegantha cyanogramma* (Q. & G.). It was kindly sent to me by Dr E. Leloup of Brussels. It is a well-preserved and typical specimen of *Pegantha laevis*. The diameter is 22 mm., the height 8 mm., the shape is flattened and the jelly fairly rigid. It has 18 tentacles. The gonads are in an advanced stage of development, very prominent and irregularly lobed as in Bigelow (1909, Pl. 20, fig. 5). Each marginal lappet has 5 short otoporpae. The lappets are bent strongly inwards and accordingly much contracted transversally; the peripheral canals are extraordinarily broad, their lateral portions frequently considerably broader than the space between them. The radiating folds in the ventral wall of the stomach, described by Ranson, are distinct, but not so regularly arranged as one would expect from Ranson's description. Similar foldings may occasionally appear in the stomach wall of other species. The specimen is entirely different from those identified by Vanhöffen (1908) as *Polyxenia cyanogramma*, and which undoubtedly belonged to *P. triloba*.

Distribution. Bigelow found this species in the tropical East Pacific, partly off the coast of Peru, partly farther west in about 14° S, 115° W, and near the Hawaiian Islands. In the Atlantic it was taken north of the Cape Verde Islands by the Atlantide Expedition (Kramp 1955), and we may now add the locality where the specimen described above was taken by the Belgian vessel 'Mercator'. The Discovery collections show that it is widely distributed in the tropical and southern parts of the Atlantic and in the western part of the Indian Ocean.

Pegantha clara R. P. Bigelow 1909

(Pl. VI, fig. 3, text-figs. 12, 13)

1908 *Polycolpa forskali* Vanhöffen, p. 56 (*non* Haeckel).
1909 *Pegantha clara* R. P. Bigelow, p. 80. 2 figs.
1909 *Pegantha smaragdina* H. B. Bigelow, p. 90. Pl. 14, figs. 1–2; Pl. 19, figs. 1–9; Pls. 22–6.
1912*a* *Polycolpa forskali* Vanhöffen, p. 391.
1912*b* *Polycolpa forskali* Vanhöffen, p. 32.
1918 *Pegantha clara* H. B. Bigelow, p. 397.
1938 *Pegantha clara* H. B. Bigelow, p. 134.
1940 *Pegantha clara* H. B. Bigelow, p. 305. Figs. 15–16.
1947 *Pegantha clara* Kramp, p. 33. Pl. 4, fig. 7; Pl. 5, figs. 1–10. Text-fig. 12.
1950 *Pegantha clara* + *smaragdina* Berrill, p. 299. Figs. 4A–E and F–K.

Occurrence: Stns 85, 247, 284, 678, 689, 697, 698, 701, 707, 708, 1370, 1373, 1576, 1585, 1749, 2066, 2068, 2069. (For details of position, date, etc., see Table 1, p. 110.)

St. 1749 is in the middle of the Indian Ocean between South Africa and Australia; Stns 1370, 1373, 1576 and 1585 are off the east coast of Africa; the other stations are scattered over the Atlantic Ocean between 30° 46′ N. (St. 2069, north of the Canary Islands) and 37° 20′ S (St. 247), (see chart, text-fig. 12).

Presumably the species was mainly taken in the upper layers, all of the hauls reaching from various depths to the surface, with the exception of the haul at St. 2066, which is stated to be hauled from 1950 to 1550 m. Previous records, in which the depths are stated, indicate that the species belongs to the upper layers.

Remarks on the morphology. In contradistinction to *P. martagon* and *laevis*, this species is mainly characterized by its long and narrow otoporpae and a continual increase in number of marginal lappets and tentacles during the growth of the individuals. Its peripheral canals are decidedly narrower than in the two other species, but broader than in *P. rubiginosa*.

The shape of the umbrella is usually rather flattened, but occasionally it may be somewhat vaulted, the gelatinous substance thick and moderately rigid, smooth; very young specimens are highly vaulted. Gonads were seen only in some few of the specimens, and they were sac-shaped or half-moon-shaped, simple or somewhat crenulated. When fully developed the marginal lappets are usually tongue-shaped with evenly rounded external edge, rarely slightly pointed, a little longer than broad, frequently one and a half times as long as broad; but owing to the continual addition of new lappets by division of the older ones we almost always find some pairs of lappets of a particularly narrow shape separated by a tentacle of smaller size than the others. Medium-sized specimens have about 21 lappets and tentacles, but the number may amount to 40, possibly even 48. In large specimens with many tentacles the lappets are generally more elongated than in specimens with a smaller number. The otoporpae are long and narrow, usually about as long as the lappets, but in young specimens much longer. In fully developed lappets, their number is most frequently 3 or 5, the median one slightly longer than the others, but sometimes there are 2 or 4. When a lappet with five otoporpae is divided, the new peronium occupies the position of the median otoporpa, and each of the two new lappets then has two otoporpae. Sometimes the otoporpae are mounted on slightly prominent gelatinous keels, but these are never prolonged beyond the ends of the otoporpae.

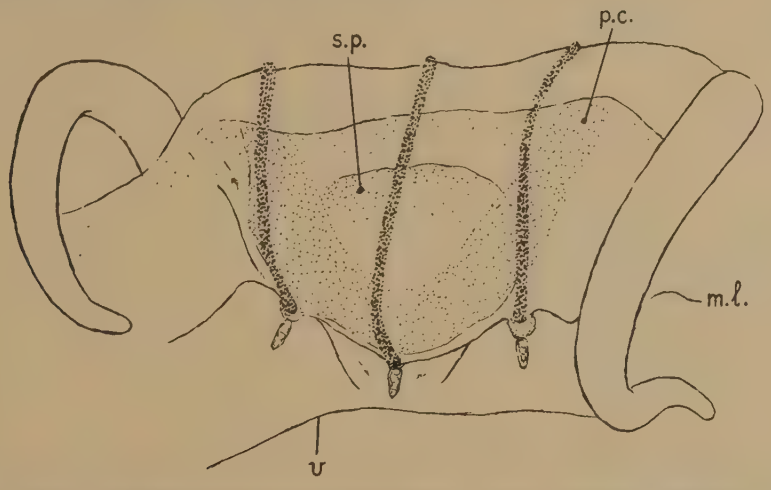
The peripheral canals (Pl. VI, fig. 3) are of nearly the same width throughout their length, fairly narrow, in fully developed lappets about one-eighth to one-sixth as broad as the lappet; in particularly elongated lappets the canals are proportionately broader, but they never approach the remarkable width as in *P. laevis*.

Text-fig. 12. Distribution of *Pegantha clara*. New records = ●, previous records = ○.

Numerous medusoid larvae were found in the canals in a specimen, 35 mm. wide, from St. 701.

The sample from St. 282 contained three fragments which may possibly have belonged to one specimen of *P. clara*, about 15 mm. in diameter. There are altogether 48 tentacles, many of them small, partly very small, and the lappets are of very different width, most of them more than twice as long as broad and usually with two very long otoporpae. The tentacles and lappets are so densely crowded that the circumference of the medusa may very well have had the great number of 48, and I am inclined to think that the three fragments may really belong to one specimen.

Four very small specimens, 3–4 mm. in diameter, were found at Stations 708 (near the coast of Brazil) and 1585 (East Africa). They have a thick and highly vaulted jelly, and also the marginal lappets are rather thick, with fairly broad canals (text-fig. 13). The lappets are as long as broad or somewhat longer, each of them with three very long otoporpae. In one of the specimens, 4 mm. wide with 10 tentacles, the otoporpae are at least twice as long as the lappets; in the three other specimens, which are 3–3·5 mm. in diameter, with 7, 8 and 9 tentacles respectively, the median otoporpa of each lappet reaches up to the very apex of the umbrella, the two others are about half as long or somewhat more, ending blindly, not connected with the median one.



Text-fig. 13. *Pegantha clara*. A marginal lappet and two tentacles of a young specimen, diameter 3·5 mm., from St. 708, *s.p.* = stomach pouch, *p.c.* = peripheral canal, *m.l.* = margin of lappet, *v.* = velum.

The collection contains 32 specimens, 29 of which could be measured, varying in diameter between 3 mm. and 50 mm. The number of tentacles in proportion to diameter of umbrella is summarized in the following table:

Average diameter (mm.)	No. of tentacles: Width of variation	No. of tentacles: Average number	No. of specimens examined
3·5	7–10	8·5	4
10·0	14–18	15·7	3
12·7	20–23	21·6	7
17·5	18–23	20·8	6
23·0	21	21·0	1
30·2	22–25	23·7	4
45·0	28–40	33·2	4
Total	7–40	20·8	29

The four largest specimens had the following numbers:

Diam. (mm.)	42	43	45	50
No. of tentacles	40	33	32	28

The figures show a rapid increase in the number of tentacles and marginal lappets during the youngest stages from 3 mm. to about 11 mm. or 12 mm. diameter; during the next period the number is fairly constant, but the differences in size between the tentacles and lappets of different age are gradually effaced, and if the growth is continued beyond a diameter of about 30 mm. or 35 mm. a further addition of tentacles and lappets takes place. The result is that in almost all stages of development, lappets of different width and tentacles of different length are present, which is a very characteristic feature of this species. Large and small tentacles may sometimes be almost regularly alternate, but as a rule the sequence is more or less irregular (see Kramp 1947, p. 33).

In 1918 H. B. Bigelow realized that the East Pacific species, *Pegantha smaragdina*, described by him in 1909 was identical with the Atlantic species, *P. clara*, described a few months earlier by R. P. Bigelow. *Solmoneta lunulata* Haeckel from the Canary Islands may possibly be identical with *P. clara*, but, as mentioned on p. 66, this identification seems to me too doubtful to be adopted. I propose, therefore, that the name *Solmoneta lunulata* be regarded as obsolete. According to Bigelow (1938) the specimens identified as *Polycolpa forskali* by Vanhöffen (1908, 1912*a* and 1912*b*) belong to *P. clara*.

Distribution. Pacific: off the coast of South America from the Gulf of Panama to about 25° S; between the Hawaiian Islands and the Caroline Islands. Widely distributed in the Atlantic between about 40° S and 50° N. Now for the first time recorded from the Indian Ocean.

Pegantha rubiginosa (Kölliker 1853)

(Pl. VI, fig. 4)

1853 *Eurystoma rubiginosum* Kölliker, in Gegenbaur, Kölliker & Müller, p. 322.
1861 *Aegineta gemmifera* Keferstein & Ehlers, p. 93. Pl. 14, figs. 10–11.
1879 *Cunina rhododactyla* + *rubiginosa* Haeckel, p. 321.
1886 *Cunina rhododactyla* Metschnikoff, p. 251.
1910 *Cunina prolifera* Mayer, p. 480.
1924 *Cunina rubiginosa* Kramp, p. 37.
1925*a* *Cunina prolifera* Ranson, p. 91.
1936 *Cunina rubiginosa* (*pars*) Thiel, p. 77.
1936 *Cunina rubiginosa* Ranson, p. 199.
1936 *Cunina lativentris* Damas, pp. 1177–97. Figs. Larvae.
1940 *Cunina prolifera* Bigelow, p. 303.
1951*b* *Cunina rubiginosa* Vannucci, pp. 106, 112, 113.
1955 *Pegantha rubiginosa* Kramp, p. 280.
1854 *non Cunina prolifera* Gegenbaur.

The specific name *Cunina rubiginosa* was maintained by me in 1924. Bigelow (1940) referred this species to the Solmaridae, genus *Polycolpa* 'if that genus be recognized'. I have recently referred it to the genus *Pegantha*. Thiel (1936) has erroneously identified it with almost all the species of *Cunina*.

Occurrence: St. 697. 12. v. 31. 09° 15′ 15″ N, 30° 01′ 45″ W. Net: TYFB 460–0 m. 1 specimen. South-west of the Cape Verde Islands.

The specimen is well preserved, 7 mm. in diameter, with 13 tentacles. The jelly is thick and highly vaulted. Each of the marginal lappets, which are almost semicircular, has two or four otoporpae; when there are four, two of them are very long, longer than the lappet, flanked by two short ones. The peripheral canals are narrow, of equal width throughout. Gonads are not developed.

The narrow peripheral canals and the evenly rounded outline of the marginal lappets are characteristic of this species. It is also characteristic that as a rule there are two long and two short otoporpae on each lappet; an odd number is rarely found (see Pl. VI, fig. 4).

Distribution. Common in the Mediterranean. First recorded from the Atlantic by Ranson (1925*a*)

in two localities off the coast of Portugal and near the Azores, later by the same author (1936) between the Azores and North America; south of the Canary Islands and in the Gulf of Guinea (Kramp 1955); between the Cape Verde Islands and the north-east coast of Brazil (Vannucci 1951*b* and the present specimen). Damas (1936) found larvae, presumably belonging to this species (under the name of *Cunina lativentris*), parasitic in *Tomopteris* in three localities west of the Strait of Gibraltar and also in the Bay of Biscay. The records by Thiel (1936) with his accompanying map of distribution are unreliable, because he united several different species under the name *Cunina rubiginosa*.

Pegantha triloba Haeckel 1879

1879 *Pegantha triloba* Haeckel, p. 333. Pl. 19, figs. 4–7.
1908 *Polyxenia cyanogramma* Vanhöffen, p. 56. Pl. 2, fig. 8.
1909 *Pegantha triloba* Bigelow, p. 87. Pl. 14, fig. 3; Pl. 16, fig. 3; Pl. 20, figs. 1–3; Pl. 45, figs. 1–2.
1910 *Pegantha triloba* Mayer, p. 443. Figs. 293, 294, 297.
1912*a* *Pegantha triloba* Vanhöffen, p. 389. Fig. 22.
1912*b* *Pegantha triloba* Vanhöffen, p. 30. Pl. 1, figs. 11–12.
1918 *Pegantha triloba* Bigelow, p. 395.
1948*a* *Pegantha triloba* Kramp, p. 15.
1948*b* *Pegantha triloba* Kramp, p. 11.
1949 *Pegantha triloba* Ranson, p. 134.

Occurrence: No station number. 29. ix. 25. 25° 47′ S, 14° 48′ W. Net: HN 0 m. 7 specimens.
St. 291. 24. viii. 27. 03° 46′ N, 16° 49′ W. Net: TYF 100(–0) m. 1 specimen.
St. 2063. 2. v. 37. 03° 24′ 48″ S, 07° 51′ 12″ W. Net: N 450 B 1150–600 m. 1 specimen.

The first of these localities is about mid-way between South America and South Africa, the two others are outside the Gulf of Guinea.

The two specimens from Stns 291 and 2063 are 25 mm. wide with 14 tentacles, and 23 mm. wide with 13 tentacles respectively; they are well preserved and typical specimens, their gonads are well developed and distinctly tripartite with finger-shaped lobes. The seven specimens from the first locality are young stages with the following dimensions:

Diam. (mm.)	5	5	5	6	7	7	15
No. of tentacles	13	13	14	14	12	15	15
Otoporpae per lappet	3	5	5	5	5	6	7

The jelly is thick and rigid; the radiating keels on the exumbrella, typical of this species, are very distinct in the marginal zone, but in the central part they are less pronounced than in the adult specimens. Otoporpae run along the entire length of the gelatinous keels, the median one from each lappet reaching right to the top of the umbrella, meeting in the centre, the others join it at different distances from the marginal zone. Gonads are not developed. These young specimens are very similar to that figured by Vanhöffen (1908, Pl. 8, fig. 8) under the name of *Polyxenia cyanogramma*.

Distribution. Widely distributed in the tropical parts of all the great oceans, but apparently not very common in the Atlantic.

Genus Solmaris Haeckel

Here again Thiel (1936, pp. 58 ff.) has gone much too far in uniting almost all the species under one name, *S. flavescens* (Kölliker). As the genus is represented in the Discovery collection by one specimen only, I shall abstain from any attempt on a revision of the species for the present.

Solmaris corona (Keferstein & Ehlers 1861)

1910 *Solmaris corona* Mayer, p. 437.
1953 *Solmaris corona* Russell, p. 476. Pl. 28, fig. 2. Text-figs. 313, 314.

Occurrence: St. 100. 30. ix–1. x. 26. 33° 20′ S, 15° 18′ E to 33° 46′ S, 15° 08′ E. Net: TYF 0–5 m. 1 specimen.

The locality is near the Cape of Good Hope. The specimen is 8 mm. in diameter with 28 tentacles; it is somewhat mutilated, but sufficient details are retained for certain identification; parts of the gonads are retained.

In the British Museum (Natural History), London, I have seen numerous small specimens, collected in Durban Bay, 26. viii. 1915, labelled by E. T. Browne as *Solmaris*. They evidently belong to *S. corona*.

Distribution. Mediterranean. North Atlantic around the British Isles and on the west coast of Norway. Also recorded from the Canary Islands (Haeckel 1881, as *S. coronantha*) and collected by the 'Atlantide' Expedition in two localities in the Gulf of Guinea (Kramp 1955, p. 276); now shown to occur around South Africa. Records from the Indian and Pacific Oceans are more or less doubtful as long as a thorough revision of the different species has not been carried out.

Family Cuninidae *sensu* Bigelow 1909

Narcomedusae with undivided radial gastric pouches, equal in number to the tentacles.

The family comprises the genera *Cunina* Eschscholtz 1829 and *Solmissus* Haeckel 1879 and the doubtful genus *Cunissa* Haeckel 1879. As previously stated by me (Kramp 1953, p. 304) there is not sufficient reason to retain the genus *Cunoctantha* Haeckel 1879 as distinct from *Cunina*.

Genus Solmissus Haeckel

Cuninidae without peripheral canal system or otoporpae.

Among the four species referred to this genus by Haeckel only one, *S. albescens* (Gegenbaur 1856), can be recognized as a valid species, and it is the type species of the genus. It is very common in the Mediterranean and has been found nowhere else. *S. ephesius* Haeckel may be a young stage of the same species. *S. ambiguus* Neppi (1915) from the Adriatic Sea is certainly identical with *S. albescens*. Two other valid species are described: *S. incisa* (Fewkes 1886) and *S. marshalli* Agassiz & Mayer 1902. *S. faberi* and *bleekii* Haeckel are supposed to be identical with *incisa*, but I doubt the correctness of this supposition. In *S. faberi*, which occurred in the South-West Atlantic, the gastric pouches are described as heart-shaped, wider outwardly, and cleft by the insertions of the tentacles, thus very different from the gastric pockets of *incisa*. In *S. bleekii*, from the Atlantic coast of South Africa, the pouches are said to be rectangular, presumably similar to those of *S. marshalli*, but there are twice as many tentacles and marginal lappets, 32 against 14–16, and there is only one marginal club on each of the lappets. The names *faberi* and *bleekii*, therefore, cannot take priority over *incisa* or *marshalli*.

S. albescens and *marshalli* have about the same number of tentacles (up to 16). In *marshalli*, of which numerous specimens are present in the Discovery collection, the gastric pouches are strictly rectangular, about as long as wide; in *albescens* they are more or less rounded, frequently pentagonal. This difference might not be decisive, but *albescens* is also characterized by numerous small warts on the exumbrella, whereas in *marshalli* the exumbrella is smooth. I think we must keep these two species apart.

A new and thorough description with excellent figures of *Solmissus marshalli*, based on living specimens, was given by Bigelow (1909, p. 64), so that no doubt of its structure is left. The description of *S. incisa* in the same paper (p. 67) is less complete; this species is particularly fragile, and the specimens at Bigelow's disposal were more or less damaged. When more than 40 mm. in diameter, they had 20–32 tentacles; a small specimen, 10 mm. wide, had 16 fully developed and 3 small tentacles. As the greatest number observed in *marshalli* was 16, the two species were mainly distinguished from

each other by their numbers of tentacles. As mentioned below, however, I have seen two specimens of *S. marshalli* with as many as 20 tentacles, so that in certain cases specific identification might be doubtful, if no other distinguishing features could be pointed out. A difference seems to exist in the number of statocysts, but these are very readily lost in both species. Apparently, however, the outline of the gastric pouches presents a characteristic difference between the two species. The radial 'elevations' and 'depressions', 24–32 in number, on the subumbrellar side of the disc, mentioned and figured by Fewkes (1886 pp. 954 ff.) in his description of *S. incisa*, evidently mark the outline of the gastric pouches, which themselves had disappeared. According to the figure, these pouches were oval, somewhat elongated and well separated from each other. In 1938 (p. 129) Bigelow likewise described the pouches of *incisa* as 'oval in outline and somewhat longer than broad'. I have been able to note this in several, otherwise much damaged, specimens in the collection from the 'Dana' expeditions. Therefore, in cases of doubt, e.g. in fragmentary specimens, the outline of the gastric pouches provides us with a reliable distinguishing character, and I think we may recognize three distinct species of *Solmissus*: *albescens* in the Mediterranean, and *incisa* and *marshalli*, both of which are widely distributed in the great oceans.

Solmissus marshalli Agassiz & Mayer 1902

(Text-fig. 14)

1902 *Solmissus marshalli* Agassiz & Mayer, p. 151. Pl. 5, figs. 23–5.
1906 *Solmaris punctatus* Mayer, p. 1133.
1909 *Solmissus marshalli* Bigelow, p. 64. Pl. 16, figs. 5–6; Pl. 21, figs. 4, 6–8.
1919 *Solmissus marshalli* Bigelow, p. 329.
1928 *Solmissus marshalli* Uchida, p. 89.
1940 *Solmissus marshalli* Bigelow, p. 308.

Occurrence: Stns 102, 270, 273, 276, 284, 286, 287, 298, 407, 440, 448, 680, 698, 701, 702, 1371, 1373, 1374, 1568, 1585, 1606, 1768, 2053, 2059, 2061. (For details of position, date, etc., see Table 1, p. 110.)

St. 1585 is off the coast of Somaliland, East Africa; Stns 440, 1371, 1373, 1374 and 1568 are off the south-east coast of Africa; St. 680 is off the Atlantic coast of Brazil; the other localities are scattered over the eastern Atlantic from south-west of the Cape of Good Hope to the Cape Verde Islands (see chart, text-fig. 14).

The bathymetrical range is uncertain. At three of the stations it was apparently taken in deep water, 500–250 m. (St. 102), 900–550 m. (St. 2053), and 1900–1500 m. (St. 2061). In all the other localities it was taken in hauls reaching to the surface, sometimes from deep water, but mainly from depths of less than 300 or 200 m.

Most of the specimens are less than 35 mm. in diameter, but one is 43 mm. (St. 2059). The marginal sensory clubs could only be counted in two specimens and then only in some few of the lappets; in a specimen 31 mm. wide (St. 1371) there are about 10, in a specimen 35 mm. wide (St. 1373) two of the lappets have at least 9.

The number of tentacles in specimens of different size will be seen from the following table:

Diam. (mm.)	Average diam.	No. of tentacles: Width of variation	No. of tentacles: Average number	No. of specimens examined
16–20	19·0	11–12	11·7	3
21–25	25·0	14–16	15·0	2
26–30	27·8	11–20	14·9	12
31–35	32·6	15–20	15·4	5
43	43	16	16·0	1

Text-fig. 14. Distribution of *Solmissus marshalli*. New records = ●, previous records = ○.

Almost all the specimens of medium size have 14–16 tentacles. The only specimen with 10 tentacles was taken at St. 1371; it is 31 mm. in diameter, and besides the ten fully developed tentacles a tiny one is situated in the middle of one of the marginal lappets; two other specimens from the same station, both 28 mm. wide, have about 11 tentacles. The large specimen, 43 mm. wide with 16 tentacles, was taken at St. 2059. As a rule the rectangular gastric pouches are as long as broad or a little longer. In the only two specimens with more than 16 tentacles the number is 20, and their gastric pouches are comparatively short and broad and of somewhat different size, some of them almost twice as broad as long, and the corners are slightly rounded. They are, however, quite different from the pouches in *S. incisa*, and in spite of the large number of tentacles in these two specimens I refer them without doubt to *S. marshalli*. They were taken at Stns 284 and 1606, in hauls 300–0 m. and 190–0 m. respectively.

Distribution. Most of the previous records of this species are from the tropical Pacific, but under the name *Solmaris flavescens* it was recorded by Vanhöffen (1908, p. 58) from several localities in the tropical Indian and Atlantic Oceans and probably again, under the same name, in 1912*a* (p. 394) from three localities off the west coast of Africa, between the Cape Verde Islands and 20° S. The record by Ranson (1936, p. 208) from the Mediterranean, near the Balearic Isles, is peculiar, and one cannot but suppose that the only specimen belonged to *S. albescens*. Ranson, it is true, describes the gastric pouches as more pronouncedly rectangular than in *S. albescens*; the pentagonal outline generally seen in this latter species is, however, not quite constant, but may sometimes approach the rectangular shape of the pouches in *S. marshalli*.

Genus Cunina Eschscholtz

Cuninidae with otoporpae; with or without peripheral canal system.

Attempts at a revision of the numerous species of *Cunina* (incl. *Cunoctantha*) were made by Bigelow (1909, pp. 51 and 55; 1918, p. 392) and Thiel (1936, pp. 77 and 82). Within the species with more than eight tentacles (*Cunina* sensu stricto), Bigelow recognized 5 species: *globosa* Eschscholtz 1829, *lativentris* Gegenbaur 1856, *proboscidea* Metschnikoff and Metschnikoff 1871, *duplicata* Maas 1893, and *peregrina* Bigelow 1909. I have not seen *lativentris* and *proboscidea* myself, but the three others are represented in the Discovery collections. To Bigelow's revision I shall only add the fact that a gelatinous peduncle, which is emphasized as characteristic of *proboscidea*, was also found in the present specimens of *globosa*, but since this species has a well-developed peripheral canal system, whereas the canal system is degenerate in *proboscidea*, these two species are evidently distinct. Bigelow is inclined to regard *C. duplicata* Maas as identical with *lativentris*; the present collection, however, contains several specimens of a *Cunina* which I believe must be referred to *duplicata*, for it is impossible to identify them with *lativentris* as described and figured by Gegenbaur. On the other hand, there is the possibility that *lativentris* is the same as *globosa* (see below). Provisionally I think we should retain the five species mentioned by Bigelow but no more of this group of *Cunina*, abandoning *mucilaginosa* Chamisso & Eysenhardt 1821, *campanulata* Eschscholtz 1829, *vitrea* Gegenbaur 1856, and *oligotis* Haeckel 1879. According to Bigelow (1914, p. 33), *C. discoides* Fewkes 1881*b* is probably a young *Solmissus*. *Cunina prolifera* Gegenbaur and *rhododactyla* Haeckel are identical with *rubiginosa* Kölliker and should be transferred to the genus *Pegantha* (see above). I entirely disagree with Thiel (1936) who would reduce the number of species of *Cunina* to one or two (*mucilaginosa* and *rubiginosa*).

Thiel retains the genus *Cunoctantha*, but unites all the species under the name *octonaria*. I think we may state that there are four distinct species, and owing to their variable number of antimeres (usually 8, but varying from 7 to 10 or 11) I refer them all to *Cunina*. *C. octonaria* McCrady 1857 (including *köllikeri* Müller 1861 and *parasitica* Metschnikoff 1881) has no peripheral canals; its

gastric pouches are variable in shape, but always broad and never resembling those of the three other species. *C. fowleri* (Browne 1906) is likewise destitute of peripheral canals, but the spindle-shaped gastric pouches are very characteristic, and its way of developing medusa buds from the gastric pouches, projecting into the bell cavity, is remarkable. I have seen the type specimen in the British Museum (Nat. Hist.). The same asexual propagation occurs in *C. frugifera* Kramp 1948*a*, a species richly represented in the present collection; it has a well-developed canal system, and its gastric pouches are separated by broad triangular spaces. *C. tenella* (Bigelow 1909), which also has a well-developed peripheral canal system, is distinguished by its triangular, pointed gastric pouches.

Cunina octonaria McCrady 1857

1857 *Cunina octonaria* McCrady, p. 109. Pl. 12, figs. 4–5.
1910 *Cunoctantha octonaria* Mayer, p. 461. Pl. 55, figs. 1–2. Text-figs. 304–5.
1910 *Cunoctantha octonaria* var. *köllikeri* Mayer, p. 464.
1910 *Cunoctantha parasitica* Mayer, p. 465.
1915 *Cunoctantha octonaria* Bigelow, p. 316.
1932 *Cunoctantha octonaria* Menon, p. 29.
1935 and 1936 *Cunoctantha octonaria* (*pars*) Thiel, p. 82.
1951*b* *Cunoctantha octonaria* Vannucci, pp. 112, 115, 116.
1951 *Cunoctantha octonaria* Nair, p. 71.
1953 *Cunina octonaria* Kramp, p. 304.
1955 *Cunina octonaria* Kramp, p. 284.

Occurrence: St. 282. 12. viii. 27. 01° 11′ S, 05° 38′ E. Net: TYF 300(–0) m. 1 specimen.
St. 677. 28. iv. 31. 31° 16′ 15″ S, 29° 56′ 30″ W. Net: TYFV 2000–0 m. 1 specimen.
St. 694. 10. v. 31. 04° 05′ 30″ N, 30° 00′ W. Net: TYFB 210–0 m. 2 specimens.
St. 701. 16. x. 31. 14° 39′ 18″ N, 25° 51′ 42″ W. Net: TYFB 242–0 m. 2 specimens.
St. 1373. 21. v. 34. 31° 13′ 06″ S, 31° 48′ 42″ E. Net: N 100 B 135–0 m. 2 specimens.

St. 1373 is near the south-east coast of Africa, the others are between the coasts of tropical Africa and South America.

Three of the specimens have seven tentacles, the other five specimens have eight.

Distribution. Widely distributed in the warm parts of all the oceans, including the Mediterranean.

I may add that in the British Museum (Nat. Hist.) I have seen the young specimens of *Cunina* from Chagos, mentioned by Browne (1916 p. 201); most of them, but not all, undoubtedly belong to *C. octonaria*.

Cunina frugifera Kramp 1948

1948*a* *Cunina frugifera* Kramp, p. 18. Pl., figs. 1–6.
1955 *Cunina frugifera* Kramp, p. 285.

Occurrence: St. 100. 30. ix.–2. x. 26. 33° 20′ S, 15° 18′ E to 33° 46′ S, 15° 08′ E. Net: TYF 0–5 m. 7 specimens; 475(–0) m. 1 specimen.
St. 254. 21. vi. 27. 35° 04′ S, 02° 59′ 30″ E. Net: TYF 200(–0) m. 1 specimen.
St. 697. 12. v. 31. 09° 15′ 15″ N, 30° 01′ 45″ W. Net: TYFB 460–0 m. 1 specimen.
St. 699. 14. v. 31. 14° 27′ 15″ N, 30° 02′ 15″ W. Net: TYFV 500–250 m. 1 specimen.
St. 714. 30. x. 31. 35° 09′ 30″ S, 47° 00′ W. Net: TYFB 246–0 m. 1 specimen.
St. 1374. 24. v. 34. 31° 46′ 36″ S, 29° 46′ 18″ E. Net: TYFB 230–0 m. 1 specimen.
St. 1568. 11. iv. 35. 34° 47′ 36″ S, 34° 27′ 54″ E. Net: TYFB 1400–0 m. 3 specimens.
St. 1585. 1. v. 35. 00° 06′ S, 49° 45′ 24″ E. Net: TYFB 500–0 m. 1 specimen.

St. 1585 is off the Somaliland coast, East Africa, Stns 1374 and 1568 off the south-east coast of Africa; St. 100 is near the Cape of Good Hope, Stns 697 and 699 are west and south-west of the Cape Verde Islands, St. 714 is off the coast of Uruguay, South America.

The specimens vary in diameter from 4 mm. to 10 mm. The number of tentacles varies between 6 and 9, regardless of the size of the specimens, as follows:

No. of tentacles	Diam. (mm.) 4	5	6	7	8	9	10	No. of specimens
6	—	1	—	—	—	—	—	1
7	—	—	—	3	—	—	—	3
8	1	—	3	2	3	—	1	10
9	—	1	—	—	—	1	—	2

In this collection most of the specimens have 8 tentacles; the original specimen described by me in 1948 had 9. Among 15 specimens from the west coast of Africa (Kramp 1955), 11 had 9 tentacles, 2 had 8 and 2 had 7. The number of antimeres is thus rather variable in this species.

Medusa buds are developed on the subumbrellar side of the gastric pockets in ten specimens of all sizes.

In all the specimens the gastric pouches are typical in shape, broad at their base, rapidly tapering outwards and separated by triangular spaces. As mentioned above, this species differs from *C. fowleri* in the possession of well-developed peripheral canals and in the shape of the gastric pouches, which are spindle-shaped in *fowleri*.

Distribution. Originally described from the Bay of Cadiz; recently recorded from three localities south of the Canary Islands and in the Gulf of Guinea; the present collection shows that the species is widely distributed in the warm parts of the Atlantic Ocean and off the east coast of Africa as well.

Cunina globosa Eschscholtz 1829

1829 *Cunina globosa* Eschscholtz, p. 117. Pl. 9, figs. 3*a–c*.
1909 *Cunina globosa* Bigelow, p. 57. Pl. 15, fig. 3; Pl. 17, figs. 3, 8.
1910 *Cunina globosa* Mayer, p. 476. Text-figs. 311–12.
1918 *Cunina globosa* Bigelow, p. 393.
1856 ?*Cunina lativentris* Gegenbaur, p. 260. Pl. 10, fig. 2.
1904 ?*Cunina lativentris* Maas, p. 31.
1936 ?*Cunina lativentris* Damas, p. 1177 ff.

Occurrence: St. 100. 1–2. x. 26. 33° 20′ S, 15° 18′ E to 33° 46′ S, 15° 08′ E. Net: TYF 0–5 m. 2 specimens; 475(–0) m. 2 specimens.

The locality is near the Cape of Good Hope.

The specimens have the following dimensions:

Diam. (mm.)	12	12	15	18
No. of tentacles	11	12	12	13

These specimens agree so perfectly with Bigelow's description and figures of specimens from the tropical East Pacific, that I refer them to the same species without any doubt. The umbrella is highly vaulted, with a thick jelly; the gastric pouches are square, about as wide as long, and close together, separated by very narrow septa. The marginal lappets are short and broad, with well-developed peripheral canals, each with three very short otoporpae. The specimens are all male, and in two of them the gonads are well developed, following the entire outlines of the gastric pouches as an uninterrupted folded band turning around the interior edges of the septa.

The specimens differ from Bigelow's description in only one respect: they all have a broad, conical gelatinous projection in the central portion of the subumbrella; it is not so large as in *C. proboscidea*, but according to Bigelow a similar gelatinous projection is also present in specimens of *C. lativentris*

from the Mediterranean. This might lead to the supposition that these two species were identical. They are certainly very similar in general appearance, but according to Gegenbaur's description and figure the gastric pouches in *lativentris* are narrow at their base and widening outwards. Apart from the studies on the marginal sense organs by O. & R. Hertwig (1879), no descriptions and no figures of this species have been given since those by Gegenbaur. Owing to the apparent difference in the shape of the gastric pouches I think we should provisionally keep the two species apart, until renewed examination of the Mediterranean medusa has shown whether the characteristic outline of the pouches in *lativentris* is a constant feature. I feel sure that Bigelow was right in referring his specimens to *C. globosa* Eschscholtz, and I feel equally sure that the specimens collected off South Africa by 'Discovery' belong to the same species.

I am not convinced of the correctness of the identification of specimens from the North Atlantic as *C. lativentris* by Damas (1936); they are referred to that species, because they had 8–12 tentacles, broad gastric pouches, and a peripheral canal, but no other details are given.

DISTRIBUTION. Tropical Pacific, about 180° W near the equator (Eschscholtz); Pacific coast of Mexico (Bigelow). Now for the first time recorded from the Atlantic.

Cunina peregrina Bigelow 1909

(Text-fig. 15)

1909 *Cunina peregrina* Bigelow, p. 59. Pl. 1, fig. 6; Pl. 15, figs. 1–2; Pl. 28, figs. 1–7; Pl. 45, fig. 8.
1918 *Cunina peregrina* Bigelow, p. 393.
1928 *Cunina peregrina* Uchida, p. 87.
1948*a* *Cunina peregrina* Kramp, p. 18.
1955 *Cunina peregrina* Kramp, p. 282.

OCCURRENCE: Stns 677, 697, 699, 701, 707, 1371, 1374, 1576, 1770, 2067. (For details of position, date, etc., see Table 1, p. 110.)

Most of the localities are scattered over the Atlantic Ocean from south-west of the Canary Islands to the latitude of the Cape of Good Hope. Stns 1371 and 1374 are off the south-east coast of Africa, St. 1576 near Mozambique on the east coast of Africa (see chart, Text-fig. 15). Moreover, I have seen a specimen in the British Museum (Nat. Hist.), taken south-east of Africa, in 35° 00′ S, 46° 36′ E (29. iv. 1937); it was labelled ? *Solmaris* sp.

The collection contains 31 specimens of this characteristic species, which was so well described by Bigelow (1909) that it cannot be mistaken, except when the number of tentacles is particularly small, about 8. I have recently pointed out how, in such cases, it may be distinguished from *C. octonaria*, which is also destitute of peripheral canals.

The number of tentacles and marginal lappets in relation to diameter of the umbrella in the present collection may be summarized as follows:

Average diam. (mm.)	No. of tentacles: Width of variation	No. of tentacles: Average number	No. of specimens examined
4·5	8–12	10·7	6
7·6	7–14	11·2	22
12·0	12	12·0	2
Total	7–14	11·1	30

The smallest specimens are 4 mm. in diameter, one with 8, two with 11 tentacles. The largest specimen is 13 mm. wide with 12 tentacles. Among the specimens 6–10 mm. wide one has 7 tentacles and one has as many as 14, in the others the number varies from 10 to 12, and most of them have 12.

Text-fig. 15. Distribution of *Cunina peregrina*. New records = ●, previous records = ○.

The figures indicate a slight increase in number of tentacles and lappets during growth of the individuals. I noticed this also in the collection from the west coast of Africa taken by the 'Atlantide' Expedition (Kramp 1955). The otoporpae are narrow; when their number could be ascertained, it varied between 5 and 10 per lappet.

Distribution. Pacific coasts of Mexico and Peru; around the Galapagos Islands; Japan. In the Atlantic it has been found north of the Bahamas (Bigelow 1918), south-west of the Azores (Kramp 1948*a*), and in several localities off the west coast of Africa between the Canary Islands and Dahomey in the Gulf of Guinea (Kramp 1955). The present collection shows that it also occurs in the tropical West Atlantic and off the east coast of Africa. There is no record in the literature from the Indian Ocean, but during a visit to the British Museum (Nat. Hist.) in 1954 I saw two specimens, correctly identified as *C. peregrina*, taken near Chagos by 'Sealark', 17. v. 1905; they are 7–7·5 mm. wide with 11–12 tentacles.

Cunina duplicata Maas 1893

(Pl. VI, fig. 5; Pl. VII, figs. 1, 2, text-fig. 16)

1893 *Cunina duplicata* Maas, p. 52. Pl. 5, figs. 9–10.

Occurrence: St. 100. 30. ix–2. x. 26. 33° 20′ S, 15° 18′ E to 33° 46′ S, 15° 08′ E. Net: TYF 0–5 m. 12 specimens; TYF 475(–0) m. 1 specimen.
St. 282. 12. viii. 27. 01° 11′ S, 05° 38′ E. Net: TYF 300(–0) m. 3 specimens.
St. 699. 14. v. 31. 14° 27′ 15″ N, 30° 02′ 15″ W. Net: TYFB 370–0 m. 1 specimen.
St. 715. 31. x. 31. 38° 44′ 12″ S, 49° 18′ 42″ W. Net: TYFB 230–0 m. 1 specimen.
St. 1370. 18. v. 34. 39° 46′ 36″ S, 38° 18′ 24″ E. Net: N 100 B 113–0 m. 5 specimens.
St. 1576. 25. iv. 35. 14° 42′ S, 42° 22′ 12″ E. Net: TYFB 400–0 m. 1 specimen.
St. 1606. 31. x. 35. 26° 15′ 48″ S, 12° 18′ E. Net: TYFB 190–0 m. 1 specimen.
St. 1974. 1. iii. 37. 52° 58′ 24″ S, 48° 20′ 24″ W. Net: TYFB 1600–1000 m. 1 specimen.

Stns 100, 282, 699 and 1606 are off the west coast of Africa between the Cape of Good Hope and the Cape Verde Islands; St. 715 is in the West Atlantic off Cape Corrientes, Argentina; St. 1974 is between South Georgia and the Falkland Islands; St. 1370 is south-east of Africa; St. 1576 in the Mozambique Channel (text-fig. 16).

Cunina duplicata has been observed only once before, when an immature specimen, 20 mm. in diameter with 16 tentacles, was described by Maas from a locality south of the Cape Verde Islands. The most characteristic feature of the species was emphasized as being the regular alternation of eight large and eight small tentacles and large and small gastric pouches. This might simply denote a stage of development lost during further growth, and that is in fact what really happens, as seen in the present specimens. There is, however, a specific character of much greater importance. Among the species of *Cunina* with many tentacles (more than 8 or 10), *duplicata* is the only species in which the gastric pouches are narrow, tongue-shaped, and equal in width to, or even narrower than the spaces between them. This is distinctly seen in Maas's figure and in all the specimens examined by me.

The present collection contains 26 specimens of all sizes, ranging between 4 mm. and 58 mm. in diameter. Some of the young stages are very similar to that described by Maas, large and small gastric pouches and tentacles almost regularly alternate, but later on the development proceeds irregularly; even in the largest specimens new tentacles are developing, and the total number may amount to 27. Another characteristic feature is the considerable width of the lateral parts of the peripheral canals; this is less pronounced in the young stages which, therefore, do not diverge much from Maas's figure, in which the canals are fairly narrow. The present specimens likewise agree with *C. duplicata* in the number and shape of the otoporpae; there are usually three on each of the marginal lappets, and they are very small. Previous anthors (Mayer 1910, p. 481; Bigelow 1909, p. 57 and

Text-fig. 16. Distribution of *Cunina duplicata*. New records = ●, previous record = ○, Maas, 1893.

1918, p. 393) point out the considerable resemblance of *C. duplicata* to *C. lativentris*, but the present specimens are certainly entirely different from *lativentris*, and I think we may safely refer them to the species, *duplicata*, described by Maas.

Description of an adult specimen (St. 1974) (Pl. VI, fig. 5): Diameter 50 mm. Umbrella flat, the jelly (as preserved in formalin) rather thin and soft; 27 tentacles in different stages of development. The oral wall of the stomach has almost entirely disappeared, but the outlines of the gastric pouches are undamaged. When fully developed, the gastric pouches are tongue-shaped or rectangular, somewhat longer than broad, with parallel sides, separated by spaces of about the same width. The gonads form a continuous, folded band following the edge of the stomach with its gastric pouches uninterruptedly. The lateral parts of the peripheral canals are very broad, usually broader than the interradial spaces between them, of equal width throughout their length, about two-sevenths as long as the radius of the umbrella. The distal, transverse part of the canals is narrow. The fully developed tentacles issue from the terminal ends of the gastric pouches; the endodermal tentacle roots are bent sharply downwards and usually invisible from above. In this specimen all the tentacles are strongly contracted and fairly short, reaching only slightly beyond the margin of the umbrella. Several of the tentacles are small (young) and more or less widely separated from the corresponding gastric pouches, which also are smaller than those corresponding to the fully developed tentacles. The peripheral canals flanking the young tentacles are also narrower than the others. In about one-third of the circumference of this specimen, young and fully developed tentacles alternate regularly. Further remarks on the development of the tentacles and gastric pouches will be given below. There are two or three sensory clubs on each of the marginal lappets, and the otoporpae are very small. The peronia are very narrow, and in the marginal zone the lappets are separated by very slight indentations. The velum is much torn and mutilated. According to a note on the label, the peripheral canal was milk white in colour, otherwise the specimen was transparent and colourless.

Remarks on other specimens

Young stages. Even very small specimens may safely be referred to this species on the basis of the gastric pouches, which are elongated, rectangular with parallel sides, as wide as or somewhat narrower than the interradial spaces between them. The youngest specimen is only 4 mm. wide (St. 699) and has 9 narrow gastric pouches and 9 tentacles of equal size, with no indication of additional tentacles developing. A specimen 5 mm. wide (St. 1370) has 8 fully developed tentacles and 2 or 3 small ones. Three specimens from St. 282 are of particular interest. One of them is 7 mm. wide with 10 tentacles of equal size, each of the ten lappets has a slight median incurvation with a tiny rudiment of a tentacle; in this specimen the oral wall of the stomach is retained and has a small circular mouth opening. The two other specimens from St. 282 are somewhat further developed; one of them is 8 mm. wide with 9 fully developed and 8 very small tentacles, the other is 10 mm. in diameter with 11 fully developed tentacles and 9 small ones, a little larger than in the preceding specimen. In both specimens the gastric pouches correspond in size to the tentacles, and these specimens are very similar to the one described and figured by Maas. In subsequent stages the addition of new tentacles and gastric pouches proceeds irregularly, and the number of small tentacles is always less than that of the fully developed tentacles.

The development of additional antimeres is illustrated in Pl. VII, fig. 1. The specimen (St. 100) is 29 mm. in diameter and has a total number of 23 tentacles. In the marginal lappet between two fully developed tentacles (to the left of the figure), the transverse part of the peripheral canal has formed a small centripetal sling, narrow and pointed; the two parts of the sling are close together, forming a narrow groove which will become the future peronium, and at the end of this groove a

very tiny tentacle is situated; as yet there is no indication of a gastric pouch corresponding to this young tentacle. Between the next two fully developed tentacles, the development has proceeded somewhat further; a small gastric pouch has been formed, the sling of the canal has come into communication with it, the peronium has increased considerably in length, but there is still some distance between the tentacle and the gastric pouch. Presumably each of the two original lappets has had three otoporpae, but the median one has disappeared at the beginning of the formation of the canal sling; when the division is finished and the two new lappets have attained their final width, new sensory clubs and otoporpae will arise, so that there will be two or three of them in each of the fully developed lappets. In this specimen the gonads are in the act of developing, but the folding as seen in larger specimens has not yet appeared; the walls of the gastric pouches are smooth.

The total number of tentacles in specimens of different size are as follows:

Diam. (mm.)	4	5	6	6	7	8	8	8	9	10	17	18	19	22	23	23	29	29	31	33	46	48	50	58
No. of tentacles	9	11	10	14	10	10	13	17	12	20	13	18	20	20	18	19	23	29	20	26	20	19	27	24

In some of the specimens the tentacles are greatly extended, being about as long as the diameter of the umbrella. When sensory clubs are retained (Pl. VII, fig. 2) they are seen to be about 56 μ in length and 26 μ in width; the statolith, which has been dissolved by the formalin, has been deposited in one fairly large space in the terminal end of the club. The sensory club is situated on a small epithelial cushion. The otoporpa is hardly broader than the club and about three times as long.

In all the present specimens the two canals flanking each of the tentacles are at least as wide as the corresponding gastric pouch. May it not be something like this that Haeckel has seen in his genus *Cunissa*, in which 'jede radiale Magentasche an ihrem Distal-Rande in 2 Lappentaschen sich spaltet'? *C. duplicata*, however, cannot belong to either of the two species of '*Cunissa*', none of which have been found since they were described by Haeckel.

Distribution. *Cunina duplicata*, previously known from only one locality south of the Cape Verde Islands, occurs in the central and southern parts of the Atlantic between the Cape Verde Islands and South Georgia, and off the southern part of the east coast of Africa. It apparently belongs to the upper layers, though in the southernmost locality it was taken in a haul between 1600 and 1000 m.

COMMENSAL LARVAE OF NARCOMEDUSAE

Larvae of Narcomedusae were found attached to the subumbrella of the following species of medusae: *Bougainvillia platygaster*, *Rhopalonema velatum*, *Rhopalonema funerarium* and *Pantachogon haeckeli*. The larvae evidently belong to four different species. In all, the development proceeds in a very similar way which, however, differs fundamentally from the development of the other narcomedusa-larvae previously described. Larvae attached to the subumbrella of other medusae and feeding by inserting their prolonged manubrium into the stomach cavity of the host were described by McCrady 1856 and 1857, Brooks 1886, Wilson 1887, and Bigelow 1909, while a general survey of the development of narcomedusa-larvae was given by N. J. Berrill in 1950. In all these cases, it is stated by the authors that the larvae propagate by budding, but the primary individual, as well as all the others, develops into a medusa, so that (as emphasized by Brooks) there is no true alternation of generations. In all the present cases, on the other hand, the development is a true metagenesis, as will be seen from the following description.

The larvae are collected in clusters attached to the subumbrella of the host by means of a number of threads, which are really the tentacles of the primary individual of the cluster. These tentacles are solid, with an endoderm consisting of one row of disc-like cells and terminating in an adhesive, knob-like expansion studded with nematocysts. The body of the primary individual is merely a

tiny knob with no indication of a medusoid structure; it acts as a stolo-prolifer from which other individuals arise by budding, and all these individuals are successively developed into medusae. This is especially clearly seen in young clusters consisting of only few individuals. In their youngest stage the medusoid buds are knob-like, but very soon they develop a long, hollow proboscis, like a trunk, with a terminal mouth-opening. The proboscis usually attains a considerable length, before the umbrella of the future medusa makes its first appearance as an annular dilatation of the proximal part of the bud.

I have observed this in all the present specimens. Further development proceeds in rather different ways in the different species, and at the time of liberation the young medusae, derived from the four different hosts, differ so much from each other that they undoubtedly must belong to four different species of narcomedusae. Presumably the infection takes place in a way similar to that described by Brooks (1886), where an actinula-like larva attaches itself to the subumbrella of the host (a *Turritopsis*) by means of its capitate tentacles and gives rise to a number of medusa buds; but in the specimens observed by him the primary larva itself was transformed into a medusa with a long proboscis and an umbrella, and all the medusa buds were, like the primary individual, liberated at a stage provided with two kinds of tentacles. These consisted of four large capitate tentacles directed upwards and four secondary, still very tiny tentacles, whereas, on the contrary, in all the specimens observed by me all the tentacles of the medusa buds are of equal size and structure, and the primary individual remains in a polypoid stage. Accordingly the development must be regarded as a true metagenesis.

Attached to **Bougainvillia platygaster**

(Pl. VII, figs. 3, 4)

St. 680. 30. iv. 31. 22° 36′ S, 30° 01′ 30″ W. Net: TYFB 260–0 m.
St. 683. 2. v. 31. 16° 48′ S, 29° 54′ 45″ W. Net: TYFB 290–0 m.

These localities are off the east coast of Brazil.

The specimens of infected *Bougainvillia* are all of about the same size, 9 mm. in diameter, and all of them are well preserved; all their organs are retained and undamaged (in contradistinction to the other species, see below), but gonads are not developed. The clusters of narcomedusa larvae are always attached to the subumbrella of the host inside the triangular pouches between the subumbrella and the aboral wall of the square, flattened stomach. As long as the clusters are very young, with only few buds, the medusoid buds are usually also seen inside the periphery of the stomach, but in further stages of development the cluster hangs outside the stomach wall, the buds bending their proboscis towards the mouth of the host. The capitate tentacles of the primary individual maintain their grip above the aboral wall of the stomach (Pl. VII, fig. 3); they vary in number between four and six.

St. 680, two specimens infected. (1) With four very small clusters, one in each interradius. Two of them have only one or two tiny buds still without a proboscis, in the third cluster one of the buds has a short proboscis; in the fourth cluster two buds are provided with a long proboscis and one of them with a small umbrella, scalloped in the margin and with tiny rudiments of 8 tentacles. (2) With five clusters of very numerous medusa buds in different stages of development, two clusters in one of the interradial quadrants, one in each of the others (Pl. VII, fig. 3). The 8 tentacles first appear as tiny knobs, but gradually they become elongated and pointed; in young stages they point upwards, but later on they are directed downwards; long and deep peronia are soon developed.

St. 683, one specimen infected. With four clusters of larvae, interradially situated, two of them consisting of only two buds, both with a long proboscis; a third cluster has three buds, one of them with a small umbrella and tiny rudiments of tentacles; in the fourth cluster four of the buds have a long

proboscis, and the largest of them is a well-developed small medusa, not far from liberation. A fifth cluster has accidentally been detached and was found loose inside the bell cavity of the host. Besides the primary individual the cluster consists of two young buds without an umbrella, but each with a long proboscis, and one medusa in an advanced stage of development (Pl. VII, fig. 4). It is 0·7 mm. in diameter; the jelly is fairly thick in the marginal lappets as well as in the central part of the umbrella. The eight marginal lappets are somewhat longer than broad, ovate in outline and somewhat pointed at the end, the peronia are deep in their proximal part, considerably broadening outwards. A peripheral canal is present. The 8 tentacles are directed downwards, tapering in thickness and reaching a little beyond the bell margin. Each lappet carries three otoporpae, the two lateral ones are about as long as the lappet, the median one reaches almost to the summit of the exumbrella and runs along an elevated and fairly sharp keel. Only the median sensory club is developed; it is comparatively large. The velum is broad. The proboscis is very long, conical in its basal part.

I am inclined to think that these larvae belong to *Pegantha triloba*; the ovate, pointed outline of the marginal lappets, the very long otoporpae, and the keels on the exumbrella point in this direction, and apart from the proboscis (which is retained as long as the young medusa is attached to the cluster) they are very like the young medusa, 2·5 mm. wide, of this species, figured by Bigelow (1909, Pl. 16, fig. 3).

Attached to Rhopalonema velatum

(Pl. VII, figs. 5–7)

St. 250. 17. vi. 27. 36° 09′ S, 05° 33′ W. Net: TYF 300(–0) m.
St. 254. 21. vi. 27. 35° 04′ S, 02° 59′ 30″ E. Net: TYF 200(–0) m.
St. 679. 29. iv. 31. 26° 06° 30″ S, 30° 06′ 15″ W. Net: TYFB 300–0 m.

These localities are between South Africa and the southern part of Brazil.

In each of these localities one specimen of *Rhopalonema* was found infected with clusters of narcomedusa larvae, attached to the subumbrella near the base of the manubrium by means of the capitate tentacles of the primary individual of each cluster. The hosts are much degenerated, having lost almost all their organs; in the specimens from Stns 250 and 254 the manubrium is retained; gonads and radial canals have entirely disappeared in all the specimens, but in the specimen from St. 254 the canals are regenerated in a very irregular way. Traces of the marginal tentacles may be discerned.

Each specimen carries one cluster of larvae attached near the base of the manubrium, and one of the medusa buds is always much further developed than the others in the same cluster.

The cluster of larvae from St. 250 (Pl. VII, fig. 5) consists of one well-developed medusa with a long proboscis and with elongated, pointed tentacles; two small buds, each with a long proboscis but with only a slight indication of the future umbrella; and in addition an undetermined number of very small knob-like buds. The primary individual (the stolo-prolifer) has four tentacles.

In the cluster from St. 254 (Pl. VII, fig. 6), one medusa is in an advanced stage of development, the proboscis is fairly short, the tentacles have not yet attained their pointed shape but are knob-like. On the top of the medusa three very small buds are seen without any indication of umbrella, two of them with a short proboscis. The stolo-prolifer has six tentacles of somewhat different size.

The cluster from St. 679 (Pl. VII, fig. 7) is in a very early stage of development. There are only two buds, one much larger than the other, both with a proboscis but no umbrella; the stolo-prolifer has three tentacles, and in this cluster it is clearly seen that the buds, which are destined to become medusae, are derived directly from the stolo-prolifer.

Before the liberation, the medusa has 11 short, pointed tentacles, all of equal size, directed downwards. The eleven marginal lappets are square, separated by fairly deep and narrow peronia; each of

the lappets has two statocysts with very short otoporpae; no peripheral canal. A narrow velum is present.

The presence of otoporpae and the absence of peripheral canals indicate that the larvae here described belong to some species of *Cunina*. Bigelow (1909, p. 62, Pl. 45, figs. 3–7) found a stolon attached to the subumbrella of a *Rhopalonema velatum*. From the description, it is not quite clear whether the stolon was attached to the host by means of capitate tentacles or whether the primary individual itself attained a medusoid structure. The cluster of medusa buds consisted of several individuals, many of them of about equal size. When liberated they had 6–8 tentacles, the marginal lappets had two statocysts with otoporpae and no peripheral canal. They were supposed to belong to *Cunina peregrina*. In spite of the larger number of tentacles and lappets (eleven) I am inclined to think that the present specimens also belong to *C. peregrina* which, among the species of *Cunina* with more than (normally) eight tentacles, is the only species destitute of peripheral canals.

Attached to **Rhopalonema funerarium**

(Pl. VII, figs. 8, 9)

St. 2059. 30. iv. 37. 09° 11′ 24″ S, 05° 17′ 24″ W. West of Angola, Africa. Net: N 450 B 1900–1400 m.

The specimen of *R. funerarium* is fairly well preserved, though without gonads. On the subumbrella, close to the base of the manubrium, a dense cluster of larvae is attached by means of five capitate tentacles of the primary individual, which acts as a stolo-prolifer. The medusoid larvae are very numerous and densely crowded, many of them (at least 15) with a very long proboscis, and several buds have a small umbrella. There is not, as in the other cases described, one single individual much larger than the others, but a fair number are at an equally advanced stage like the one figured in Pl. VII, fig. 8. They have eight small, pointed tentacles. The eight marginal lappets are separated by well-developed, fairly narrow peronia. Each lappet has two fairly large statocysts with small otoporpae (Pl. VII, fig. 9). No peripheral canals, but a distinct marginal nettle-ring. Velum well-developed.

These medusae differ from those found in *R. velatum* by the number of tentacles and lappets not exceeding eight and by the larger size of the marginal clubs. They probably likewise belong to the genus *Cunina*, but I do not venture to guess which species they may be referred to, possibly to some unknown deep-sea species.

Attached to **Pantachogon haeckeli**

(Pl. VII, figs. 10, 11)

St. 85. 23. vi. 26. 33° 07′ 40″ S, 04° 30′ 20″ E. West of Cape of Good Hope. Net: N 450 2000(–0) m.

The specimen of *Pantachogon* is destitute of manubrium and gonads; the margin with its tentacle stumps is partly retained, sufficient to identify the species. A cluster of larvae is situated on the subumbrella near the site of the manubrium, which has been lost. The cluster (Pl. VII, fig. 10) consists of medusoid buds in different stages of development connected with each other and with the primary individual by irregularly branched filiform bridges. The primary individual is attached to the subumbrella of the host by three fairly long and thin, capitate tentacles, its body is very small and shows no indication of a medusoid structure. The youngest buds are destitute of tentacles and proboscis; they soon attain a single tentacle, which is capitate, other tentacles are developed successively, so that the older buds have a number (4–6) of tentacles of different sizes, all terminating in a knob-like cluster of nematocysts. Simultaneously with the tentacles a long proboscis is developed. When the umbrella begins to appear, the tentacles are seen to be directed upwards.

Three young medusae had already been detached from the cluster and were found in the subumbrella cavity of the host, retained by the broad velum. One of them is seen in Pl. VII, fig. 11. They are

about 2 mm. in diameter and 1 mm. in height, and they have 7–8 tentacles, fairly long, capitate, and held in an upright position. In this regard they resemble the young medusa of *Cunina octonaria* figured by Brooks (1886), but the eight tentacles are all of equal size. The eight marginal lappets are broad, the peronia deep and broad. Each of the lappets has two sensory organs; the sensory clubs are not yet fully developed, but a short otoporpa is distinctly seen above each of them. A broad peripheral canal is present. Velum is well developed, but fairly narrow. The larval proboscis is reduced, and the ventral wall of the stomach is flattened, with a central mouth opening.

It is difficult to determine the affinity of these larvae. The number of tentacles and lappets may not remain eight. Capitate tentacles may occur in larvae of *Cunina* (*octonaria*, according to Brooks 1886) as well as in *Pegantha* (*clara*, according to Kramp, 1947). Peripheral canals are present in all species of *Pegantha* and in some species of *Cunina*, but are absent in *Solmaris* and *Solmissus*. The larvae described above probably belong either to *Cunina* or to *Pegantha*, but all known species of these genera have their principal occurrence in the upper layers. The present larvae were found attached to the bathypelagic medusa, *Pantachogon haeckeli*, and I therefore presume that they belong to an unknown deep-sea species.

Tabular view of the appearance of the medusae when liberated:

Host	Tentacles		Statocysts per lappet	Otoporpae	Peripheral canals	Umbrella
	Number	Shape				
Bougainvillia platygaster	8	Filiform	3	Very long	Present	With 8 prominent keels
Rhopalonema velatum	11	Filiform	2	Short	Absent	Smooth
Rhopalonema funerarium	8	Filiform	2	Short	Absent	Smooth
Pantachogon haeckeli	8	Capitate, upright	2	Short	Present	Smooth

ZOOGEOGRAPHICAL REMARKS

The occurrence of medusae may be influenced by various physical factors, but some of these are of importance only under extreme conditions. For example, in coastal waters with a considerable influx of fresh water from the rivers, the salinity of the water is of decisive importance in the distribution of medusae (although its influence may vary with the species), but within the oceanic areas covered by the Discovery Investigations variations in salinity are not great enough to have a significant effect. Oxygen content, nitrates and phosphates may indirectly, through the amount of food animals available, determine the abundance of the specimens, but can hardly alter the specific composition of the fauna. Some species of medusae are morphologically adapted to live in the deep water-layers (where the movements of the water are very slight), and are provided either with a very thick gelatinous mesogloea or with a strong musculature. Frequently, however, it is apparently not the depth itself, but the temperature of the water, which prevents certain species from ascending into the upper layers. Thus in the open ocean a dominant factor in the distribution of medusae is the temperature of the water, and for holopelagic species it is often the only factor of importance, although indeed some of these medusae can tolerate a wide range of temperature. For meropelagic neritic forms the configuration of the sea bottom, to which the fixed polyp stages are attached, may also prevent the penetration of some species into areas where the physical conditions might seem suitable to maintain the medusae.

In a discussion of the distribution of the medusae it is necessary to take into consideration their life-history and their ecological habitat. We must distinguish between meropelagic and holopelagic species, and within each of these groups some species are predominantly epipelagic, others predominantly bathypelagic, although in some cases no sharp line of demarcation can be drawn.

The Leptolina, comprising the Antho-, Lepto- and Limnomedusae, are presumably all meropelagic, and the majority of them are neritic, being derived from hydroids which are attached to objects on the bottom in the coastal regions. In many species the duration of the pelagic life is so short that the medusae cannot possibly be carried far away from the coastal waters by the currents, but in some species the pelagic phase is long enough to allow them to drift into remote regions far from their place of origin, either along the coast, if the current takes that direction, or out into the open sea.

Some few species of Leptolina, however, must be designated as truly oceanic, in so far as they are regularly found far out in the great oceans. Some of them may have littoral hydroids, but an oceanic existence is made possible by the ability of the medusa to propagate by budding, producing several successive generations of medusae. In other instances we know nothing about their propagation, either sexual or asexual; we can only state that they do occur in the open oceans, evidently independent of the coasts.

The Trachylina, comprising the Trachy- and Narcomedusae, are holopelagic, passing their whole life-cycle in a free-swimming condition. Some of them are decidedly bathypelagic, occurring in the deep layers only; others are epipelagic, their occurrence being restricted to the surface waters, down to depths of 100 to 250 m. Again, some species are bathypelagic in tropical and subtropical regions, whereas they may be found nearer the surface in cold areas, indicating that they are more dependent on temperature than on the actual depth of the waters. There are also some species which have their principal habitat in the upper layers, but which occasionally, or under certain conditions, descend to quite considerable depths. In some cases, therefore, the distinction between epipelagic and bathypelagic species is to some degree arbitrary.

Distribution of the Species of Hydromedusae taken by the Discovery Investigations

Tables 2–4 give the geographical distribution of the Hydromedusae collected by the Discovery Investigations during the years 1926 to 1937, but in order to complete the picture, records of these species from previous expeditions have also been included. The species have been arranged in the following groups:

(1) Neritic species of Leptolina (Table 2, p. 124).

(2) Oceanic species of Leptolina and Trachylina, predominantly epipelagic (Table 3, p. 125).

(3) Oceanic species of Leptolina and Trachylina predominantly bathypelagic (Table 4, p. 126).

The seven new species, the further distribution of which is not yet known, are not included in the tables. In each table the species are arranged approximately according to their distribution from South to North. This gives a general impression within each group of the penetration of the species away from or into the Antarctic waters, and also indicates which of the species are bipolar.

The regions shown in Tables 2 and 3 and used in the discussion of the distribution of the Hydromedusae are based on the proposals put forward by Ekman in his *Zoogeography of the Sea* (1953). I have made some slight alterations in the names of the regions, for example West-Atlantic for East-American, East-Atlantic-tropical for West-African-tropical etc., and I have separated the East-African-tropical area from the comprehensive Indo-West-Pacific-tropical, region as a distinct region. Each of these large regions may of course be subdivided into minor faunistic provinces, but for the sake of simplification I have refrained from doing this as it would make the discussion unnecessarily complicated. The Antarctic region is, however, divided into three sectors: the Pacific, Atlantic and Indian sectors, because the material available varies very greatly in these three areas.

The regions shown in Tables 2 and 3 may be defined roughly as follows:

Antarctic region. The waters south of the Antarctic Convergence, the mean position of which lies between 50–55° S.

West-Atlantic-antiboreal region. Comprising the south-western part of the Atlantic Ocean between the Antarctic and Subtropical Convergences and off the east coast of South America as far north as Montevideo, between 50–55° S and 35° S.

West-Atlantic-tropical region. Comprising the waters off the American coasts between about 35° S and 35° N. Within this region, Discovery Collections were made as far north as about 10° N, midway between Brazil and West Africa.

West-Atlantic-boreal region. Comprising the waters off the American coast from about 35° N up to Labrador.

Arctic region. Comprising the waters north of the Boreal region.[1]

East-Atlantic-boreal region. Comprising the waters of north-western Europe from the English Channel to the north point of Norway.

Mediterranean-Atlantic region. Comprising the Mediterranean Sea and the adjacent Atlantic Ocean between the Bay of Biscay and the Cape Verde Islands. Within this area only four Discovery Collections were made, between about 24° N and 39° N.

East-Atlantic-tropical region. Comprising the waters off the west coast of Africa between about 15° N and Great Fish Bay in 17° S.

South-African region. Comprising the waters off the African coasts between Great Fish Bay on the west coast and Durban, in about 28° S, on the east coast.

East-African-tropical region. Comprising the waters off the east coast of Africa, north of Durban. No collections were made by the Investigations in any other part of the Indo-West-Pacific-tropical region, between the years 1926 and 1937.

Indo-West-Pacific-tropical region. Comprising the waters of the tropical Indian Ocean and the western Pacific from the Polynesian Is. northwards to about 35° N.

Indian-temperate region. Comprising the antiboreal belt north of the Antarctic Convergence and the subtropical tract between South Africa and south-western Australia.

South-Australian–New-Zealand region. Off the Australian coasts, south of about 30° S, and New Zealand.

Pacific-boreal region. Comprising the waters north of 35° N in the western part; 25° N in the eastern part.

East-Pacific-tropical region. Between southern California, about 25° N, and about 8° S, off northern Peru.

Peru-North-Chilensic region. Comprising the waters between 8° S and 42° S.

Of course Ekman's areas mainly apply to the fauna of the continental shelves; his divisions of the oceanic regions are very wide and comprise only a warm-water region and one or two cold-water regions in each of the three great oceans. It seems desirable, however, to distinguish between minor areas also in the distribution of oceanic animals, especially for the epipelagic species, which are partly exposed to the same currents as the neritic forms. Consequently, in Table 3 which shows the distribution of the epipelagic Leptolina and Trachylina, I have retained the same divisions for the Atlantic Ocean as I have used in Table 2 for the distribution of the neritic forms. But I have condensed the Indian-temperate and the South-Australian–New-Zealand regions into an Indo-West-Pacific-antiboreal region, and have united the Peru-Chilensic region with the East-Pacific-tropical region, because in these areas only such species were found as occur in tropical seas. This arrangement has been adopted here to coincide with the areas covered by the Discovery Investigations; in a general zoogeographical discussion I might proceed otherwise.

Bathypelagic species, which live under quite different conditions, are not limited to regions in the same way, and in Table 4 it will be seen that I have condensed the distributional regions still further.

[1] The deep water-layers in the Davis Strait, west of southern Greenland belong to the boreal region; the deep water-layers in the Norwegian Sea belong to the arctic deep-sea area.

Neritic species of Leptolina (Table 2)

As Table 2 shows, not all the distributional regions are covered by the Discovery collections, and the area most extensively investigated is the Atlantic Ocean, from which by far the most material is available and to which the succeeding remarks mainly apply.

In all, thirty-four species of neritic Leptolina have been taken by the Discovery Investigations—these include the following new species: *Russellia mirabilis* from the Pacific and Atlantic sectors of the Antarctic and later found also in West-Indian waters; *Rathkea africana* from tropical West Africa; *Leuckartiara annexa* from South Africa and tropical East Africa; and *Ectopleura sacculifera* from the Pacific coast of Ecuador.

Among the remaining thirty species, nine occur in Antarctic waters, and it is characteristic that at least six of them are circumpolar. Eighteen species occur in the West-Atlantic-antiboreal region. Two of them are bipolar, *Halopsis ocellata* and *Staurophora mertensi*, both of which are found in the northern boreal region as well as in antiboreal waters near the Falkland Islands. *Staurophora mertensi* also penetrates into the Antarctic as far south as the South Orkney Islands. Apart from *S. mertensi*, only three species are common to both the West-Atlantic-antiboreal and the Antarctic regions, namely: *Cosmetirella davisi*, *Bougainvillia macloviana* and *Tiaricodon coeruleus*. This is very remarkable, since, according to Ekman (1953, p. 349), 'Quite a number of (pelagic) species are common for both this region (the antiboreal) and the antarctic, that is for the whole of the cold-water region of the Southern Ocean.' As examples Ekman mentions some species of copepods, amphipods, and euphausiids; evidently this does not hold good as far as the epipelagic medusae are concerned (see also p. 98 under the epipelagic Trachylina). This impression is confirmed by the other medusae known from the two regions but not collected by the Discovery Investigations; among thirteen of these species seven are purely antarctic, five occur in the West-Atlantic-antiboreal region (mainly at the Falkland Islands), but are not recorded from antarctic waters, and only one is known from both regions.

In the south-western Atlantic, the Antarctic Convergence evidently constitutes a fairly effective barrier between the antarctic and antiboreal faunas of neritic medusae, very few species penetrating from one of these regions to the other. The fauna of the West-Atlantic-antiboreal region, however, is a mixture of different constituents. Several of its inhabitants are characteristic of the area, but there is a considerable admixture of species belonging to tropical waters. Seven of the species shown in Table 2 penetrate into the tropics, but nine are known from southern waters only. The influence of the Brazil Current must account for this admixture of tropical species, some of which are distributed northwards into the boreal parts of the Atlantic. The antiboreal region is thus sharply limited to the south, but not to the north, the Subtropical Convergence (called the antiboreal by Ekman) being a less restricting factor to these animals than is the Antarctic Convergence.

Three of the antiboreal species appear to have a very restricted distribution between the Falkland Islands and the neighbouring coast of South America; they are *Aglauropsis conanti*, *Proboscidactyla mutabilis* and *Laodicea pulchra*. *Bougainvillia macloviana*,[1] *Tiaricodon coeruleus* and *Phialella falklandica* have a scattered occurrence in the southern parts of the Indian and Pacific Oceans also, while of particular interest is the appearance in the South African region (see pp. 4, 15, 30, 31) of the two decidedly southern species, *Sarsia gracilis* and *Halitholus intermedius*, as well as of the two antarctic species, *Mitrocomella frigida* and *Cosmetirella davisi*.

Very few neritic Leptolina were collected by the Discovery Investigations in the tropical Atlantic and they afford evidence of no particular interest, but the material from the South African region on

[1] The occurrence of *B. macloviana* in the East-Atlantic-boreal region (the North Sea) is undoubtedly due to transportation by ships.

the other hand yields important results. Among the eleven neritic species taken there by the Investigations, two were previously known only from the tropical Indian and Pacific Oceans: *Heterotiara minor* has now been taken off the south-east coast of Africa, and *Zygocanna vagans* west of the Cape of Good Hope. *Neoturris pileata*, regarded as a North Atlantic species, has been found considerably farther south than before off the west coast of Africa. All the other species found in the South African region also occur in the West-Atlantic-antiboreal region or in the Antarctic and three of them are widely distributed in the Atlantic Ocean. One of these, *Phialidium simplex*, has a scattered distribution and is known from North-East Australia, Brazil and the Falkland Islands. On the whole, the South African neritic Leptolina evidently do not constitute a local fauna but are a mixture of species, widely distributed and of different origins.

However, in this region the most interesting finds are undoubtedly those of *Sarsia gracilis* and *Halitholus intermedius*, previously known only from the Falkland Islands, and those of the two antarctic circumpolar species, *Mitrocomella frigida* and *Cosmetirella davisi*, the last also occurring in subantarctic waters near the Falkland Islands. All these medusae are so small that presumably their pelagic life is of short duration and they have little chance of being carried long distances by the currents. The nearest shallow-water area is the plateau of Bouvet Island, which is about 1300 miles away from South Africa. We must presume, therefore, that there is an indigenous, local population of these species in South African coastal waters.

In the neighbourhood of South Georgia, *Cosmetirella davisi* was abundant in the surface water at temperatures varying between about 0·5° C. and 3° C.; in subantarctic waters it lives at temperatures of about 5–6° C., sometimes perhaps as high as 9° C. (e.g. St. WS 832, near Patagonia). At St. 102, a short distance south of the Cape of Good Hope, it was taken in October 1926 in about 54 m. below the surface, where the temperature was about 14° C. *Sarcia gracilis* was taken at St. 91, in False Bay, near Capetown, in September 1936, at 35 m. and in temperatures of about 13·5° C. *Halitholus intermedius* was found in two South African localities, St. 1374 (May 1934) near the south-east coast, and St. 100 (October 1926) west of Capetown, and *Mitrocomella frigida* occurred at St. 256, somewhat farther west of the Cape of Good Hope, in June 1927. Unfortunately we do not know the exact depth of these finds, nor the temperatures, but the medusae were undoubtedly taken in the upper layers in fairly warm water. The hydrographical conditions round the South African coasts are very complicated, and the occurrence of these southern species must presumably be explained as being due to the cooling influence of the Benguela Current.

Very few neritic species of Leptolina were collected in the East-African-tropical region, where *Octophialucium aphrodite* occurred, or in the Peru-Chilensic region where *Aequorea coerulescens* and *A. macrodactyla* were taken. The occurrence of these three species in these regions presents nothing of particular interest.

Oceanic species of Leptolina and Trachylina predominantly epipelagic (Table 3)

Of the oceanic Leptolina, predominantly epipelagic, four species were taken by the Discovery Investigations. All of them occur in the warm parts of the oceans, although *Phialopsis diegensis* is also recorded from boreal waters. *Bougainvillia platygaster* and *Euphysora furcata* have so far only been taken in the Atlantic and in the westernmost parts of the Indian Ocean. None of the four species are found in antiboreal or antarctic seas.

Of the oceanic Trachylina, predominantly epipelagic, twenty species were collected by the Discovery Investigations, the majority of them being widely distributed in all the great oceans, mainly in the tropical regions. One species, *Cunina globosa*, was previously known only from the tropical East Pacific

and has now been taken in South African waters. The nineteen other Discovery species all occur in the East-Atlantic-tropical region, and fifteen of these are also found in the Mediterranean-Atlantic region and seventeen in the West-Atlantic-tropical region. Only seven species are distributed farther north into boreal waters in the North Atlantic, all of them as more or less stray visitors from the south; among them *Solmaris corona* which occurs in the eastern Atlantic, from South Africa to Norway.

Of particular interest is the southward distribution of the eighteen species which are more or less generally distributed in the warm parts of the Atlantic, most of them being also known to occur in the Indian and Pacific Oceans. With two exceptions (*Pegantha triloba* and *Pegantha rubiginosa*) they are all found in the South African region. In the western Atlantic eight of the species occur in the antiboreal region; as stated on page 96 this region receives a considerable admixture of neritic medusae from the tropical region. On the other hand, the Antarctic Convergence seems to establish as effective a barrier to the southward distribution of the holopelagic, epipelagic Trachylina as in the case of the neritic Leptolina. According to some diagrams given by Dilwyn John (1936, fig. 6, p. 203 and fig. 29, p. 246) the Antarctic Convergence seems to establish an equally sharp barrier to the distribution of the southern species of *Euphausia*. None of the epipelagic Trachylina are characteristic of the antarctic region, and only two of the species belonging to warmer seas have been found in antarctic waters, *Solmundella bitentaculata* which is circumpolar, and *Pegantha martagon* which was taken in the Pacific as well as in the Atlantic sector of the antarctic region. These two species must accordingly be very eurythermal, whereas none of the other species are able to cross the Antarctic Convergence.

Oceanic species of Leptolina and Trachylina predominantly bathypelagic (Table 4)

Most species of bathypelagic medusae have a more or less circumglobal distribution, and several of them also have an extensive distribution from north to south. Submarine barriers may prevent them from penetrating into enclosed deep-sea areas, otherwise they are independent of the coasts. A survey of their geographical distribution may therefore be given by means of comparatively few, wide regions. It is, however, insufficient merely to distinguish between warm-water and cold-water regions, so I have subdivided them in order to give a clearer impression of the distribution of the species, with special regard to the results obtained by the Discovery Investigations.

With the exception of the semibenthic *Ptychogastria polaris*, none of the bathypelagic species collected by the Discovery Investigations occurs in arctic deep-sea areas. It therefore seems best to exclude the Arctic region and to divide the great oceans into boreal, tropical, and antiboreal belts. The Antarctic region with its three sectors must, however, be kept separate. The interesting series of stations off the east coast of Africa also calls for a separate treatment of this region, as do the waters around South Africa, because the latter form a transitional area between the Atlantic and the Indian Oceans, and because extensive collections were made there.

Leptolina *predominantly bathypelagic*. Besides the new species *Euphysora gigantea*, which was taken in deep water in the Atlantic sector of the antarctic region and in the antiboreal part of the south-western Atlantic, six species belonging to this group were collected, all of them Anthomedusae. *Calycopsis bigelowi* was previously known from the East-African-tropical region only; now it has been taken in deep water west of the Cape of Good Hope. The five other species are widely distributed in the deep parts of the Atlantic Ocean, in tropical as well as boreal regions. With the exception of *Pandea rubra*, which occurs in the northern Pacific, none of these species are recorded with certainty from Indo-Pacific waters; this is remarkable, considering the wide distribution of almost all species

of bathypelagic Trachylina. It is very interesting that three of the species, *Pandea rubra*, *Chromatonema rubrum* and *Tiaranna rotunda*, were taken in the antarctic region (see fig. 5, p. 26) in company with several bathypelagic species of Trachymedusae. They were taken in the deep water below the antarctic surface water at temperatures ranging between about 0° and 1·7° C. Hydrographical observations are not available from all the localities where these species were collected, but from observations at neighbouring stations the temperatures may approximately be stated as follows:

Pandea rubra

St. 151. North of South Georgia. Jan. 1927. 1025–1275 m. 1–1·5° C.
St. 1131. East of South Georgia. Feb. 1933. 1000–800 m. 1·6–1·7° C.
St. 1989. South-east of South Georgia. Mar. 1937. 1500–1200 m. 0·2–0·4° C.

Tiaranna rotunda

St. 1702. Off Wilkes Land. Mar. 1936. 2000–1250 m. 0° C.
St. 1723. Off Queen Mary Land. Mar. 1936. 800–500 m. 1·6–1·7° C.

Chromatonema rubrum

St. 1719. Off Knox Land. Mar. 1936. 950–55 m. 0·3–0·5° C.
St. 1780. South-west of Bouvet Island. June 1936. 700–450 m. 1·5° C.
St. 1871. East of Graham Land. Nov. 1936. 1450–1000 m. 0–0·4° C.
St. 2006. Off Coats Land. Mar. 1937. 1750–1400 m.?

The temperatures in the deep and intermediate layers in the warm seas, where these medusae also occur, are not much higher, usually below 4° or 5° C., and from the North-Atlantic basin *Tiaranna* and *Chromatonema* penetrate far up into the Davis Strait west of Greenland; they may therefore be designated as bathypelagic cold-water species. Apparently *Annatiara affinis* and *Bythotiara murrayi* do not penetrate into the subantarctic or antarctic regions. They are not so strictly bathypelagic as the other species mentioned above, but belong rather to the intermediate layers, about 200–400 m. or so below the surface, where the water-temperatures are somewhat higher than in the deep-sea proper.

Trachylina *predominantly bathypelagic*. *Ptychogastria polaris* occupies a separate position; it is therefore not included in Table 4. It is partly benthic, for it clings to the sea-bottom by means of the suckers on its tentacles, but may occasionally swim upwards in the water. It has a bipolar distribution, occurring in arctic and northern-boreal as well as in antarctic areas. It was collected by the Discovery Investigations, at the bottom in two localities in the neighbourhood of the South Shetland Islands, St. 177, depth 1080 m. and St. 1958, depth 830 m. We have no information of the bottom-temperatures at these stations; they have presumably been about 0·5–1° C.

The distribution of the two species at the bottom of Table 4, *Crossota alba* and *Tetrorchis erythrogaster*, is imperfectly known and needs no discussion here.

Haliscera racovitzae and the three species of *Arctapodema* have a predominantly antarctic distribution, though *A. amplum* also occurs in the tropical Atlantic and in the Mediterranean; the others were previously known only from antarctic seas, where they occur at intermediate depths, not in the deepest layers. *Haliscera racovitzae* was taken at St. 355, east of South Georgia, in a haul 750–500 m., temperature unknown, probably about 1·7° C., and was previously recorded from the Weddell Sea and near the Antarctic Continent, about 70° S, 82° W. *Arctapodema amplum* was taken at St. WS 160, north of South Georgia, 550–250 m., temperature 2·0–1·9° C., and at St. WS 388, off the South Shetland Islands, 400–250 m., temperature −1·1° to −1·3° C. Since this species occurs in the tropical Atlantic and in

the Mediterranean and is recorded from several localities in the antarctic region (see text-fig. 9, p. 57), it must be very eurythermal. *Arctapodema antarcticum*, previously known only from near the Antarctic Continent in about 90° E, was taken in four localities, St. 1718, off Knox Land, 64° 23′ S, 106° 33′ E, 900–550 m.; St. 1838, west of the South Sandwich Islands, 700–250 m.; and near the Shag Rocks, at St. 1917, 1400–1000 m., and St. 1919, 1800–1300 m. The temperature of the deep layers was not measured at any of these stations; it probably varied between 0·5° and 2·5° C. Accordingly this species belongs to the 'warm deep water'; but it is not one of the cosmopolitan bathypelagic species penetrating southwards towards the antarctic shelf.

The third species of *Arctapodema*, *A. australe*, was not taken in the antarctic region by the Discovery Investigations, but it was described from the Gauss Station and thus apparently belongs to the antarctic fauna. It is of considerable interest that this species together with *A. antarcticum* was taken much farther north in the Indian Ocean, about 32° S. Both were taken in deep water, *A. antarcticum* at St. 1749, at 1050–600 m., *A. australe* at St. 1753, at 2900–1400 m. These stations are about midway between South Africa and south-west Australia, above the northward continuation of the Kerguelen–Gaussberg Ridge and the water-temperatures are in no way remarkable. In the series of stations along a line in 32° S, the temperatures in the deep layers increased fairly evenly from St. 1738 near Australia to St. 1762 and 1763 south of Madagascar, approximately as follows:

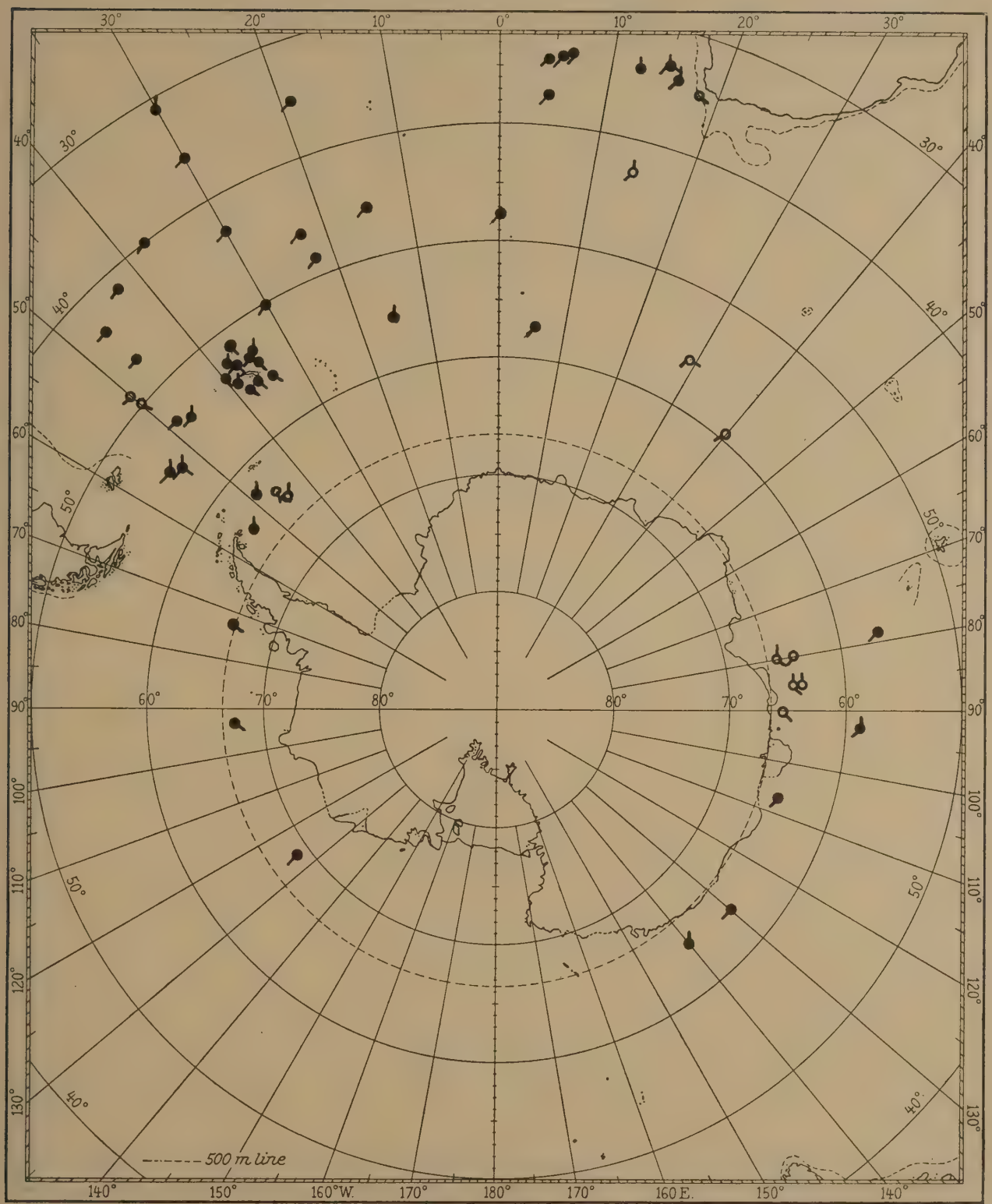
	St. 1738	St. 1750	St. 1752	St. 1762/63
600 m.	8·5° C.	10·7° C.	10·7° C.	12·4° C.
1000 m.	3·9°	6·5°	6·0°	8·1°
1400 m.	2·8°	3·0°	3·1°	3·6°
2900 m.	1·65°	1·6°	1·7°	2·3°

There is no indication of particularly low temperatures at Stns 1750 and 1752 (there are no measurements from Stns 1749 and 1753 where the two species were collected), which might explain why these antarctic medusae were found just here. Nevertheless, their occurrence in this tract of the deep water may indicate that the northward movement of the antarctic bottom water has been especially strong along the ridge (cf. Deacon 1937, p. 97).

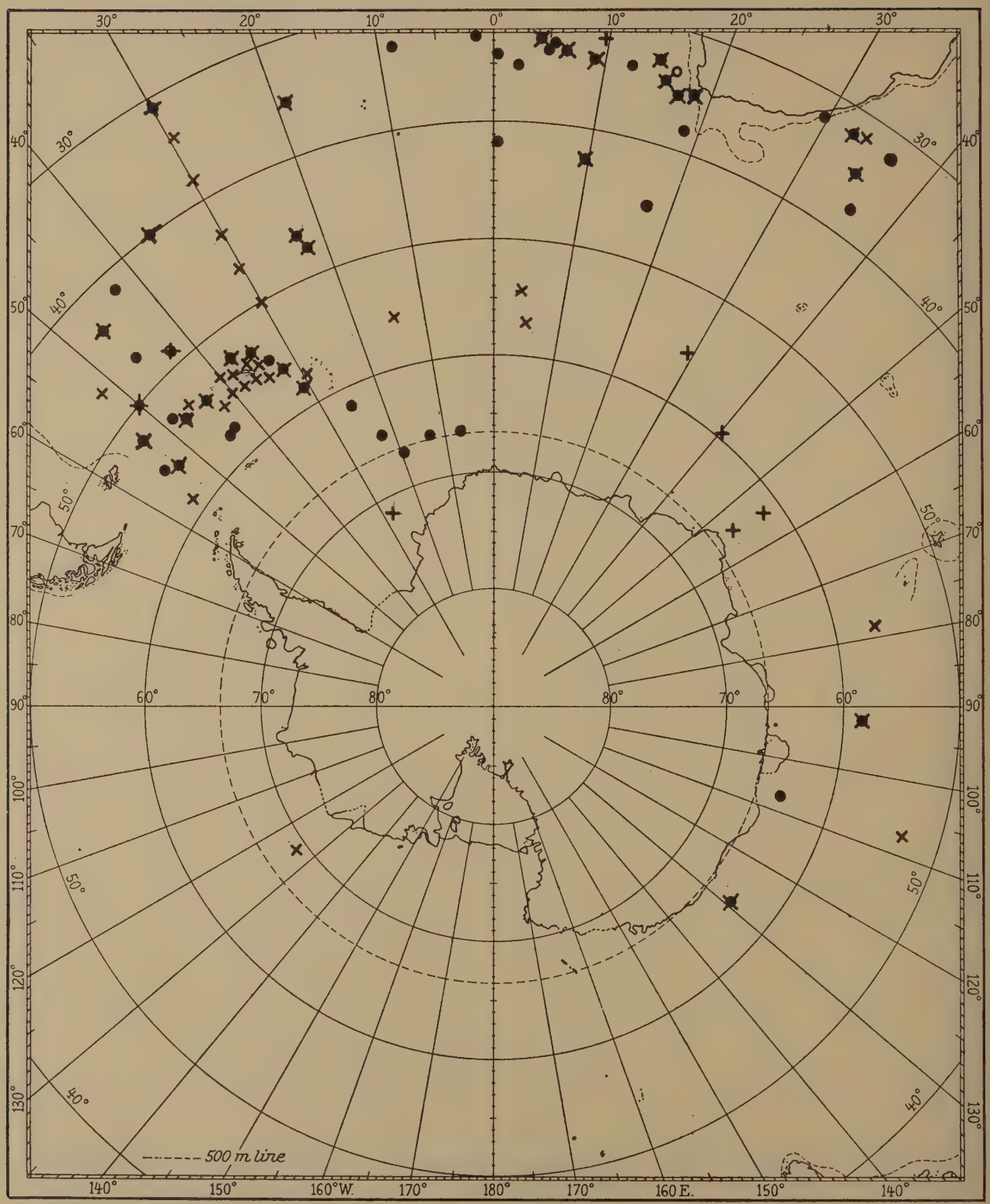
The remaining nine species of bathypelagic Trachylina are widely distributed, most of them are almost cosmopolitan in the deep water of the oceans. *Crossota brunnea*, however, occurs only in the southern hemisphere; *Haliscera conica* occurs somewhat farther north in the Atlantic and in the Mediterranean, but it has not been observed outside the Atlantic area except in the antarctic region, where it is circumpolar.

In contradistinction to the epipelagic Trachylina, most of the widely distributed bathypelagic species penetrate into the antarctic region, but there are also some species which seem to avoid the southern regions. All of them occur in the area around South Africa, most of them extending also into the boreal parts of the Atlantic and Pacific Oceans. Five of these species, *Crossota brunnea*, *Pantachogon haeckeli*, *Haliscera conica*, *Halicreas minimum*, and *Botrynema brucei*, penetrate into the antarctic region (see Text-figs. 17–18). Probably all of them are circumpolar, but very few collections have been made in the Pacific sector. The depths at which they were taken cannot be stated exactly but ranged between about 700 and 2400 m., though mainly at more than 1000 m. below the surface. Accordingly their occurrence in the antarctic region is restricted to the 'warm deep water'. One might perhaps be inclined to anticipate a difference in their bathymetric distribution according to the distance from the continental slope, but nothing is indicated by the available data. There is not much difference in the southward distribution of the species. The range of temperature was between about 0·2° and 1·8° C.

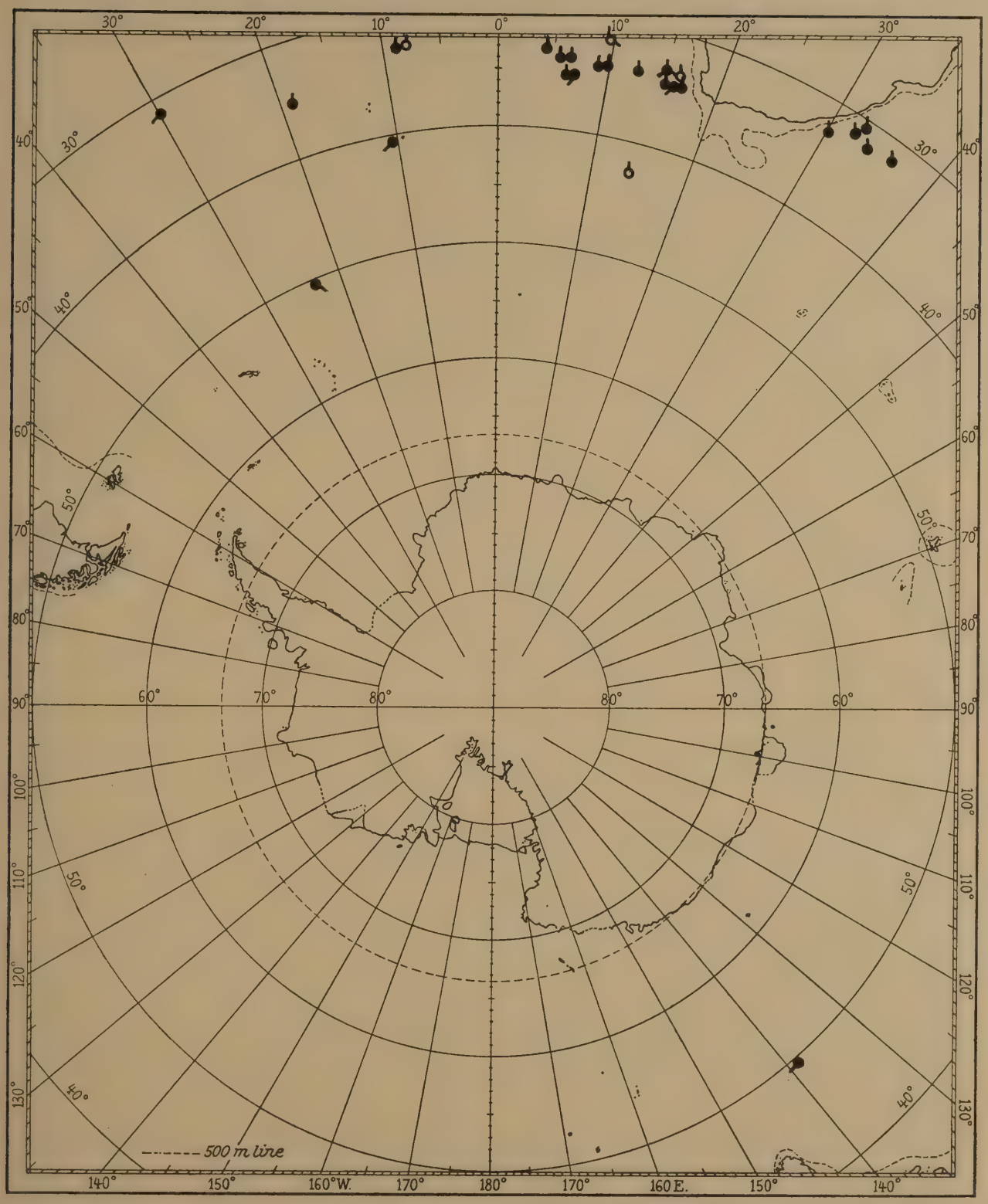
In contradistinction to these preceding five species, *Rhopalonema funerarium*, *Colobonema sericeum*, *Halitrephes maasi* and *Aeginura grimaldii* do not approach the antarctic region (see text-fig. 19). All of



Text-fig. 17. Distribution of: *Botrynema brucei* = ♂, previous records = ♂. *Crossota brunnea* = ♀, previous records = ♀. *Haliscera conica* = ♀, previous records = ♀.



Text-fig. 18. Distribution of: *Halicreas minimum* = ●, previous records = ○. *Pantachogon haeckeli* = ×, previous records = +.



Text-fig. 19. Distribution of: *Colobonema sericeum* = ♂, previous records = ♂. *Halitrephes maasi* = ♀, previous records = ♀. *Rhopalonema funerarium* = ♀, previous records = ♀.

them have a circumglobal distribution in the warm and temperate zones, where they generally occur in company with the five species mentioned above. *Rhopalonema funerarium* was taken some distance north of South Georgia, 50° 18′ S, in the intermediate layers (340–150 m., temperature 2·5–1·5° C.). It is not strictly bathypelagic, being sometimes taken at less than 200 or 300 m. below the surface, but usually deeper down (e.g. at St. 2064 in a haul 1600–1050 m.). In the waters west of Africa it was taken at temperatures between about 4° and 9° C. *Halitrephes maasi*, which mainly belongs to the southern hemisphere, may likewise be taken nearer the surface (e.g. at St. 893, south of Australia, in 110–0 m.); but as a rule it occurs at considerable depths. The lowest temperature at which it was found by the Discovery Investigations was about 4° C., at St. WS 127, south of Gough Island, in 1000–650 m. *Colobonema sericeum* was taken in deep water in numerous localities, partly west of the tropical part of Africa, partly in the Atlantic and Indian Oceans, west and east of South Africa, at temperatures from about 3° C. upwards. *Aeginura grimaldii* was only found in the tropical regions west and east of Africa. With the exception of *Halitrephes maasi*, these species occur in the northern Atlantic at temperatures similar to those at which they were found near their southern limits of distribution. Though in their principal areas of distribution, horizontal as well as vertical, these species concur with the other bathypelagic Trachylina, they evidently require a slightly higher temperature than species which are able to penetrate into the deep water of the antarctic region.

SUMMARY OF THE ZOOGEOGRAPHICAL RESULTS

The Discovery Investigations have greatly augmented our knowledge of the geographical distribution of the Hydromedusae; in all the areas examined some species were found which had not been observed there before. The numbers are seen in the tables, but it should be noted that the number of species taken in each region is not an index of the variety of the medusan fauna, for the intensity of sampling was very uneven in the different regions. Nevertheless, the figures tell us something about the results obtained.

According to the maps of distribution produced by Thiel (1936), some species of Trachylina might previously have been taken in areas whence in the present paper they are designated as new, but, as already mentioned, Thiel has in several cases united two or more species which makes his maps unreliable.

A number of species are endemic in the antarctic region, most of them neritic species of Leptolina, and we can now state that their distribution is circumpolar (Table 2). Two of them, together with two species previously known only from the Falkland Islands, are found to inhabit the coastal waters of South Africa. Among the bathypelagic Trachylina three species presumably belong to the antarctic seas, but two of them were taken in deep water within a restricted area farther north, 32° S, in the Indian Ocean (Table 4). Altogether ten species were found as new to the antarctic region, four of them are new species, and three of them are bathypelagic Anthomedusae which are widely distributed in the Atlantic Ocean from north to south (Table 4). Most of the species new to antarctic waters were found in the Atlantic sector, which was much more thoroughly investigated than the other sectors.

Our previous knowledge of the fauna of Hydromedusae in the waters off the east coast of South America was deficient. Twenty-eight species were collected in the antiboreal part of the south-western Atlantic, fifteen of them new to the region. The neritic and epipelagic fauna of Hydromedusae in this region is a mixture of species of very different origins; some few of them may be designated as true warm-water species, but most of them occur both in tropical and boreal waters (Tables 2 and 3). There are, however, also a number of neritic Leptolina which are characteristic of this region, though some of them have extended their distribution into the South African region. It is of particular

interest that very few epipelagic species of medusae are common to antarctic and antiboreal waters, the Antarctic Convergence evidently constituting an effective barrier to the distribution of these animals.

The number of species found in the West Atlantic tropical region was twenty-six, of which twelve were new to the area; all of them have an extensive geographical distribution.

Our knowledge of the fauna of medusae off the tropical west coast of Africa was considerably increased by the Danish 'Atlantide' Expedition in 1945–46, twenty-eight species of Hydromedusae being recorded as new to the area (Kramp 1955). Among the few species, which now may be added to the list, only two give occasion for some surprise: *Leuckartiara octona* which is a predominantly northern species, and *Crossota alba* which up to now was only known from the northern Pacific.

The fauna in the waters around South Africa is a mixed fauna; up to now it was very imperfectly known, but now we can state that it is a rich fauna, as far as the Hydromedusae are concerned. Forty-nine species were found by the Discovery Investigations, and among them no less than thirty-three are new to the region. Most of the finds are not astonishing, considering the complicated hydrographical conditions in this area, though several species were found to be distributed considerably farther south than known before. Three species, *Heterotiara minor*, *Zygocanna vagans* and *Cunina globosa*, were previously known only from Indo-Pacific waters. Of very considerable interest is the occurrence of the four antarctic and subantarctic neritic species, *Sarsia gracilis*, *Halitholus intermedius*, *Mitrocomella frigida*, and *Cosmetirella davisi* in the South African coastal area (see, p. 105).

A series of stations off the tropical east coast of Africa was made in April–May 1935. Twenty-one species of Hydromedusae were found, thirteen of them new to the region. Only two neritic species were found, *Leuckartiara annexa*, which is a new species, and *Octophialucium aphrodite*, which was previously known only from the Malayan Archipelago and the Philippines. All the other species found in this series are oceanic, mainly epipelagic, and four of these are now recorded for the first time from outside the Atlantic Ocean (see Table 3).

The twelve species collected in the Indian temperate region, eight of them new to the area, are all oceanic forms, widely distributed except the two species of *Arctapodema*, previously known from antarctic waters only.

The material available from the few hauls in the temperate and warm parts of the Pacific Ocean consists of only six species, one of which is a new species, *Ectopleura sacculifera*, which was taken off the coast of Ecuador. The others are of no great zoogeographical importance.

A comparison between the three tables may be summarized as follows:

Table 2. A considerable number of the neritic species of Leptolina collected by the Discovery Investigations are inhabitants of antarctic or subantarctic seas, where most of them have a circumpolar distribution. A similar number belong to warm or temperate waters; some of these have an extensive distribution from north to south, but only one penetrates into the antarctic region, namely, *Staurophora mertensi* which is bipolar. On the other hand, several of these species have a comparatively narrow distribution from west to east, being restricted either to the Atlantic area or to the Indo-Pacific areas; this also applies to some of the subantarctic species. It may partly be due to deficiency of knowledge, but it seems to be characteristic of the neritic forms that many of them occur within restricted areas and, apart from arctic and antarctic species, few of them have a circumglobal distribution. In this respect they differ from the oceanic medusae.

Table 3. The oceanic, epipelagic Leptolina are predominantly warm-water species and do not approach the antarctic waters.

Most of the epipelagic Trachylina are widely distributed in the oceans; only three species are apparently restricted to the Atlantic. On the other hand, among the twenty species collected by the Discovery Investigations only two, which are very eurythermal, penetrate into the antarctic region.

Table 4. The bathypelagic species of Leptolina behave in the same manner as the bathypelagic Trachylina. The majority of the bathypelagic species are almost cosmopolitan in the deep parts of the oceans, and several species occur in the 'warm deep water' of the antarctic region; but some species require a slightly higher temperature. Ekman (1953, p. 365) calls attention to the interesting fact that 'the comparatively slight difference in temperature between 3° and 0° or 1° seems in this case to be decisive'. This evidently applies to these few species of bathypelagic medusae, whereas a greater number of species may endure the lower temperatures in the deep water below the antarctic surface water.

The distribution of medusae, as of other pelagic animals, affords a multitude of highly interesting problems, and only some few of them are touched upon in the present paper. There are still extensive areas of the sea which are insufficiently investigated, but the comprehensive collections of the Discovery Investigations have contributed greatly towards a better understanding of many problems, the more so because the great majority of the specimens are well preserved. Certain determination of the species was therefore possible, and it should always be borne in mind that this is a necessary condition to every discussion of distributional questions.

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Table 1. *Occurrence of seventeen particularly common species of medusae collected by* R.R.S. 'Discovery' I *and* II *and* R.R.S. 'William Scoresby', 1926–37

'Discovery' Station	Position	Date	Gear	Depth (metres)	*Zanclonia weldoni*	*Calycopsis borchgrevinki*	*Cosmetirella davisi*	*Halicreas minimum*	*Haliscera conica*	*Rhopalonema velatum*	*Pantachogon haeckeli*	*Colobonema sericeum*	*Crossota brunnea*	*Liriope tetraphylla*	*Aegina citrea*	*Solmundella bitentaculata*	*Pegantha martagon*	*Pegantha laevis*	*Pegantha clara*	*Solmissus marshalli*	*Cunina peregrina*
		1926																			
9	46° 11′ 30″ S, 22° 27′ 30″ W	11. ii	N 200	1250(–0)	.	.	.	5	.	.	7	.	1	.	.	.	.	.	.	.	.
12	51° 55′ 00″ S, 32° 27′ 30″ W	18. ii	NH	0	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
17	46 miles N 46° E of Jason Lt. S. Georgia	4. iii	N 70 V	250–100	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.
29	5·9 miles S 51° W of Jason Lt. W. Cumberland Bay. S. Georgia	16. iii	NH	0	.	.	15	.	.	.	.	.	.	.	.	.	.	.	.	.	.
30	2·8 miles S 24° W of Jason Lt. W. Cumberland Bay. S. Georgia	16. iii	N 70 V	230–100	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
41 B	16½ miles N 39° E of Barff Pt. S. Georgia	28. iii	N 70 V	150–100	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
68	46° 40′ 00″ S, 51° 22′ 00″ W	24. v	N 70 H	45(–0)	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.
69	45° 06′ 00″ S, 49° 00′ 00″ W	25. v	N 70 H	45(–0)	.	.	.	.	.	6	.	.	.	.	.	.	.	.	.	.	.
71	43° 20′ 00″ S, 46° 02′ 00″ W	30. v	TYF	2000(–0)	.	.	.	1	.	.	2	.	13	.	.	.	.	.	.	.	.
72	41° 43′ 20″ S, 42° 20′ 40″ W	1. vi	N 450	2000(–0)	.	.	.	5	.	.	.	.	3	.	.	.	.	.	.	.	.
76	39° 50′ 30″ S, 36° 23′ 00″ W	5. vi	N 450	1500(–0)	.	.	.	6	.	.	1	.	10	.	1	.	.	.	.	.	.
78	35° 18′ 00″ S, 19° 01′ 10″ W	12. vi	TYF	1000(–0)	.	.	.	21	.	.	10	1	3	.	1	.	.	.	.	.	.
81	32° 45′ 00″ S, 08° 47′ 00″ W	18. vi	N 450	650(–0)	.	.	.	14	.	.	.	7	.	.	.	.	.	.	.	.	.
83	32° 30′ 50″ S, 01° 23′ 30″ W	21. vi	N 200	650(–0)	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.
85	33° 07′ 40″ S, 04° 30′ 20″ E	23. vi	N 450	2000(–0)	.	.	.	29	.	.	8	5	2	.	.	.	.	.	1	.	.
86	33° 25′ 00″ S, 06° 31° 00″ E	24. vi	N 450	1000(–0)	.	.	.	25	.	.	7	22	2	.	.	.	.	.	.	.	.
87	33° 53′ 45″ S, 09° 26′ 30″ E	25. vi	TYF	1000(–0)	.	.	.	5	.	.	4	1	.	.	.	.	1	.	.	.	.
89	34° 05′ 15″ S, 16° 00′ 45″ E	28. vi	TYF	1000(–0)	.	.	.	6	.	18	24	1	5	1	.	.	.	.	.	.	.
91	0·5 miles off Roman Rock False Bay, S. Africa	8. ix	TYF	0–5	.	.	.	.	.	.	.	.	.	6	.	.	.	.	.	.	.
100	33° 20′ 00″ S, 15° 18′ 00″ E to 33° 46′ 00″ S, 15° 08′ 00″ E	30. ix–1. x	TYF	0–5	.	.	.	.	.	.	7	.	.	6	.	1	12	2	.	.	.
100	33° 20′ 00″ S, 15° 18′ 00″ E to 33° 46′ 00″ S, 15° 08′ 00″ E	1. x	TYF	0–5	.	.	.	.	.	1	.	.	.	22	1	.	.	.	.	.	.
100	33° 20′ 00″ S, 15° 18′ 00″ E to 33° 46′ 00″ S, 15° 08′ 00″ E	2. x	TYF	450–550	.	.	.	3	.	.	.	.	.	.	.	5	.	1	.	.	.
100	33° 20′ 00″ S, 15° 18′ 00″ E to 33° 46′ 00″ S, 15° 08′ 00″ E	2. x	TYF	475(–0)	.	.	.	10	3	21	.	3	.	42	.	4	2	.	.	.	.

100	33° 20′ 00″ S, 15° 18′ 00″ E to 33° 46′ 00″ S, 15° 08′ 00″ E	2. x	TYF	625–675	.	.	.	12	.	.	.	5	.	.	.	.	.		.	.	.
100	33° 20′ 00″ S, 15° 18′ 00″ E to 33° 46′ 00″ S, 15° 08′ 00″ E	2–3. x	TYF	1500–1550	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.
100	33° 20′ 00″ S, 15° 18′ 00″ E to 33° 46′ 00″ S, 15° 08′ 00″ E	3. x	TYF	260–310	.	.	.	1	.	.	.	.	.	1	.	.	.		.	.	.
100	33° 20′ 00″ S, 15° 18′ 00″ E to 33° 46′ 00″ S, 15° 08′ 00″ E	3–4. x	TYF	900–1000	.	.	.	8	.	.	8	9	1	.	1	.	.	.	.	.	.
100	33° 20′ 00″ S, 15° 18′ 00″ E to 33° 46′ 00″ S, 15° 08′ 00″ E	1. x	TYF	250	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.
100	33° 20′ 00″ S, 15° 18′ 00″ E to 33° 46′ 00″ S, 15° 08′ 00″ E	4. x	TYF	2500–2000	.	.	.	7	.	.	10	2	.	1	.	.	.	.	.	.	.
100	33° 20′ 00″ S, 15° 18′ 00″ E to 33° 46′ 00″ S, 15° 08′ 00″ E	4. x	TYF	2500(–0)	.	.	.	6	.	.	6	1	.	1	.	.	.	1	.	.	.
101	33° 50′ S, 16° 04′ E to 34° 13′ S, 15° 49′ E	14. x	N 450	1310–1410	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.
101	33° 50′ S, 16° 04′ E to 34° 13′ S, 15° 49′ E	14. x	N 450	850–950	.	.	.	36	.	.	4	80	4	.	.	.	.	.	.	.	.
102	35° 29′ 20″ S, 18° 33′ 40″ E	28. x	N 70 V	50–0	.	.	.	.	.	1	.	.	.	1	.	.	.	.	.	.	.
102	35° 29′ 20″ S, 18° 33′ 40″ E	28. x	N 70 V	100–50	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.
102	35° 29′ 20″ S, 18° 33′ 40″ E	28. x	N 70 V	500–250	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	1	.
102	35° 29′ 20″ S, 18° 33′ 40″ E	28. x	N 70 V	750–500	.	.	.	1	.	.	.	.	.	.	.	3	.	.	.	.	.
102	35° 29′ 20″ S, 18° 33′ 40″ E	28. x	N 70 V	1000–750	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.
102	35° 29′ 20″ S, 18° 33′ 40″ E	28. x	N 100 H	0–5	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.
102	35° 29′ 20″ S, 18° 33′ 40″ E	28. x	N 100 H	52	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
107	45° 03′ 00″ S, 17° 03′ 00″ E	4. xi	N 70 V	500–250	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.
107	45° 03′ 00″ S, 17° 03′ 00″ E	4. xi	N 450	850–950	.	.	.	78	.	.	.	.	.	.	.	.	.	.	.	.	.
114	52° 25′ 00″ S, 09° 50′ 00″ E	12. xi	N 100 H	180(–90)	.	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
114	52° 25′ 00″ S, 09° 50′ 00″ E	12. xi	N 450	650–700	.	2	.	1	.	.	33	.	.	.	.	.	.	.	.	.	.
115	52° 39′ 00″ S, 09° 33′ 00″ E	12. xi	N 70 H	80(–0)	.	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
117	54° 20′ 40″ S, 03° 48′ 45″ E	17. xi	N 70 V	750–500	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.
120	51° 44′ 00″ S, 05° 19′ 00″ W	22. xi	N 100 H	575–675	.	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
129	53° 28′ 30″ S, 37° 08′ 00″ W	19. xii	N 70 V	250–100	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.
133	53° 45′ 30″ S, 35° 46′ 30″ W	20–21. xii	N 100 H	100	1	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.
137	54° 19′ 30″ S, 35° 03′ 30″ W	22. xii	N 70 V	500–250	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.
138	54° 17′ 00″ S, 34° 47′ 00″ W	22. xii	N 70 V	750–500	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.
138	54° 17′ 00″ S, 34° 47′ 00″ W	22. xii	N 100 H	77	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
139	53° 30′ 15″ S, 35° 50′ 45″ W	22–23. xii	N 70 V	100–50	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
139	53° 30′ 15″ S, 35° 50′ 45″ W	22–23 xii 1927	N 100 H	90	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.	.
151	53° 25′ 00″ S, 35° 15′ 00″ W	16. i	N 70 V	250–100	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
151	53° 25′ 00″ S, 35° 15′ 00″ W	16. i	N 70 V	500–250	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.
151	53° 25′ 00″ S, 35° 15′ 00″ W	16. i	N 450	1025–1275	.	1	.	4	.	.	1	.	5	.	1	.	.	.	.	.	.
151	53° 25′ 00″ S, 35° 15′ 00″ W	16. i	N 100 H	500–625	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
239	46° 56′ 00″ S, 46° 03′ 00″ W	2. vi	N 450	1050–1350(–0)	.	.	.	8	.	.	.	.	1	.	.	.	.	.	.	.	.

Table 1 (*cont.*)

'Discovery' Station	Position	Date	Gear	Depth (metres)	*Zanclonia weldoni*	*Calycopsis borchgrevinki*	*Cosmetirella davisi*	*Halicreas minimum*	*Haliscera conica*	*Rhopalonema velatum*	*Pantachogon haeckeli*	*Colobonema sericeum*	*Crossota brunnea*	*Liriope tetraphylla*	*Aegina citrea*	*Solmundella bitentaculata*	*Pegantha martagon*	*Pegantha laevis*	*Pegantha clara*	*Solmissus marshalli*	*Cunina peregrina*
		1927 (*cont.*)																			
247	37° 20′ 00″ S, 12° 47′ 30″ W	13. vi	TYF	100–115(–0)	.	.	.	.	.	18	.	.	.	.	.	.	.	.	2	.	.
248	37° 15′ 00″ S, 12° 20′ 00″ W	14. vi	TYF	0–5	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.
250	36° 09′ 00″ S, 05° 33′ 00″ W	17. vi	TYF	300(–0)	.	.	.	.	.	34	.	.	.	.	.	.	.	.	.	.	.
253	35° 06′ 00″ S, 02° 19′ 00″ E	21. vi	TYF	1000–1050	.	.	.	4	.	.	.	.	.	.	.	.	.	.	.	.	.
254	35° 04′ 00″ S, 02° 59′ 30″ E	21. vi	TYF	200(–0)	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.
256	35° 14′ 00″ S, 06° 49′ 00″ E	23. vi	TYF	850–1100(–0)	.	.	.	34	.	17	21	28	.	.	.	.	.	.	.	.	.
270	13° 58′ 30″ S, 11° 43′ 30″ E	27. vii	TYF	200(–0)	.	.	.	.	.	.	.	.	.	.	2	1	.	.	.	1	.
270	13° 58′ 30″ S, 11° 43′ 30″ E	27. vii	N 70 B	126–0	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.
273	09° 38′ 00″ S, 12° 42′ 30″ E	31. vii	TYF	200–230(–0)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.
273	09° 38′ 00″ S, 12° 42′ 30″ E	31. vii	N 100 B	118–0	.	.	.	.	.	.	.	.	.	7	.	.	.	.	.	.	.
275	07° 51′ 00″ S, 12° 42′ 00″ E	4–5. viii	N 70 H	0–2	.	.	.	.	.	2	.	.	.	6	.	1	.	.	.	.	.
276	05° 54′ 00″ S, 11° 19′ 00″ E	5 viii	TYF	150(–0)	.	.	.	.	.	.	.	.	.	.	28	2	3	.	.	1	.
276	05° 54′ 00″ S, 11° 19′ 00″ E	5 viii	N 70 B	110–0	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.
280	00° 36′ 00″ S, 08° 28′ 00″ E	10. viii	TYF	100–200(–0)	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.
281	00° 46′ 00″ S, 05° 49′ 15″ E	12. viii	TYF	850–950(–0)	.	.	.	3	.	.	.	2	.	.	.	.	.	.	.	2	.
282	01° 11′ 00″ S, 05° 38′ 00″ E	12. viii	TYF	300(–0)	.	.	.	2	2	42	.	.	.	190	2	150	1	.	.	.	.
284	02° 13′ 00″ S, 01° 52′ 00″ E	15. viii	N 100 B	71–0	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1	1	.
286	03° 06′ 30″ S, 03° 53′ 00″ W	17. viii	TYF	125(–0)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
287	02° 49′ 30″ S, 09° 25′ 30″ W	19. viii	TYF	800–1000(–0)	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	1	.
290	03° 25′ 25″ N, 16° 50′ 52′ W	24. viii	N 70 B	86–0	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	2	.
291	03° 46′ 00″ N, 16° 49′ 00″ W	24. viii	TYF	100(–0)	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.
296	08° 12′ 00″ N, 18° 49′ 00″ W	26. viii	TYF	450–500(–0)	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.
298	13° 01′ 45″ N, 21° 34′ 45″ W	29. viii	TYF	900–1200(–0)	.	.	.	.	.	.	2	.	.	.	5	.	.	.	.	1	.
		1930																			
300	52° 26′ 30″ S, 37° 14′ W	20. i	N 70 V	750–500	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.
301	52° 36′ 30″ S, 37° 14′ W	20–21. i	N 70 V	750–500	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.
302	52° 46′ 30″ S, 37° 12′ W	21. i	N 70 V	750–500	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.
303	53° 00′ S, 37° 11′ W	21. i	N 70 V	500–250	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.
303	53° 00′ S, 37° 11′ W	21. i	N 70 V	1000–750	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.	.	.
303	53° 00′ S, 37° 11′ W	21. i	N 70 V	750–500	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.
304	53° 06′ S, 37° 14′ W	21. i	N 70 V	500–250	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.	.	.
304	53° 06′ S, 37° 14′ W	21. i	N 70 V	750–500	.	.	.	3	.	.	1	.	.	.	.	.	.	.	.	.	.
305	53° 17′ S, 37° 10′ W	21–22. i	N 70 V	1000–750	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.

305	53° 17′ S, 37° 10′ W	21–22 i	N 70 V	500–250	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.	.	.	.	.
306	53° 28′ S, 37° 07′ W	22. i	N 70 V	500–250	.	.	.	.	.	.	.	.	.	.	.	4	.	.	.	.	.	.	.
308	54° 07′ 15″ S, 36° 24′ 30″ W	24. i	N 70 V	50–0	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
308	54° 07′ 15″ S, 36° 24′ 30″ W	24. i	N 70 V	100–50	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
309	54° 00′ 30″ S, 36° 12′ W	24. i	N 70 V	50–0	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
311	53° 47′ S, 35° 48′ 30″ W	24. i	N 70 V	500–250	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.
311	53° 47′ S, 35° 48′ 30″ W	24. i	N 70 V	690–500	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.
313	53° 32′ 30″ S, 35° 24′ 30″ W	25. i	N 70 V	250–100	.	.	.	.	.	.	.	.	.	.	.	4	.	.	.	.	.	.	.
313	53° 32′ 30″ S, 35° 24′ 30″ W	25. i	N 70 V	500–250	.	.	.	.	.	.	.	.	.	.	.	5	.	.	.	.	.	.	.
313	53° 32′ 30″ S, 35° 24′ 30″ W	25. i	N 70 V	1000–750	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.
314	53° 56′ S, 37° 14′ W	29. i	N 70 V	50–0	.	.	10	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
315	53° 46′ S, 37° 14′ W	29. i	N 70 V	50–0	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
316	53° 54′ 30″ S, 38° 01′ W	29. i	N 70 V	50–0	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
317	53° 47′ 15″ S, 38° 12′ 30″ W	29. i	N 70 V	250–100	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
319	From 53° 37′ S, 38° 39′ 30″ W to 53° 33′ 30″ S, 38° 37′ W	29–30. i	N 70 V	250–100	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.
319	From 53° 37′ S, 38° 39′ 30″ W to 53° 33′ 30″ S, 38° 37′ W	29–30. i	N 70 V	500–250	.	.	.	.	.	.	.	.	.	.	.	9	.	.	.	.	.	.	.
320	53° 10′ 30″ S, 39° 44′ 30″ W	30. i	N 70 V	500–250	.	.	.	.	.	.	.	.	.	.	.	4	.	.	.	.	.		
320	53° 10′ 30″ S, 39° 44′ 30″ W	30. i	N 70 V	1000–750	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.
321	53° 17′ S, 39° 31′ W	30–31. i	N 70 V	250–100	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.
322	From 53° 24′ 30″ S, 39° 17′ 30″ W to 53° 27′ S, 39° 22′ W	31. i	N 70 V	500–250	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
323	From 53° 28′ S, 38° 55′ W to 53° 29′ S, 38° 55′ 30″ W	31. i	N 70 V	500–250	.	.	.	.	.	.	.	.	.	.	.	5	.	.	.	.	.	.	.
323	From 53° 28′ S, 38° 55′ W to 53° 29′ S, 38° 55′ 30″ W	31. i	N 70 V	750–500	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.
325	From 54° 53′ S, 39° 40′ W to 54° 51′ S, 39° 37′ W	1. ii	N 70 V	500–250	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.
325	From 54° 53′ S, 39° 40′ W to 54° 51′ S, 39° 37′ W	1. ii	N 70 V	750–500	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.
326	From 54° 33′ S, 38° 29′ 30″ W to 54° 32′ 30″ S, 38° 28′ W	2. ii	N 70 V	50–0	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
326	From 54° 33′ S, 38° 29′ 30″ W to 54° 32′ 30″ S, 38° 28′ W	2. ii	N 70 V	100–50	.	.	6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
328	54° 20′ 30″ S, 37° 42′ 30″ W	2. ii	N 70 V	50–0	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
334	55° 43′ S, 36° 51′ W	4. ii	N 70 V	500–250	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.
335	From 55° 33′ S, 36° 49′ 30″ W to 55° 31′ 30″ S, 36° 49′ 30″ W	4–5. ii	N 70 V	50–0	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.
335	From 55° 33′ S, 36° 49′ 30″ W to 55° 31′ 30″ S, 36° 49′ 30″ W	4–5. ii	N 70 V	100–50	.	.	.	.	.	.	.	.	.	.	.	4	.	.	.	.	.	.	.
335	From 55° 33′ S, 36° 49′ 30″ W to 55° 31′ 30″ S, 36° 49′ 30″ W	4–5. ii	N 70 V	250–100	.	.	.	.	.	.	.	.	.	.	.	4	.	.	.	.	.	.	.
335	From 55° 33′ S, 36° 49′ 30″ W to 55° 31′ 30″ S, 36° 49′ 30″ W	4–5. ii	N 70 V	500–250	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Table 1 (*cont.*)

'Discovery' Station	Position	Date 1930 (*cont.*)	Gear	Depth (metres)	*Zanclonia weldoni*	*Calycopsis borchgrevinki*	*Cosmetirella davisi*	*Halicreas minimum*	*Haliscera conica*	*Rhopalonema velatum*	*Pantachogon haeckeli*	*Colobonema sericeum*	*Crossota brunnea*	*Liriope tetraphylla*	*Aegina citrea*	*Solmundella bitentaculata*	*Pegantha martagon*	*Pegantha laevis*	*Pegantha clara*	*Solmissus marshalli*	*Cunina peregrina*
335	From 55° 33′ S, 36° 49′ 30″ W to 55° 31′ 30″ S, 36° 49′ 30″ W	4–5. ii	N 70 V	750–500	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.
336	From 55° 21′ 30″ S, 36° 48′ 30″ W to 55° 20′ S, 36° 48′ 30″ W	5. ii	N 70 V	250–100	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.
336	From 55° 21′ 30″ S, 36° 48′ 30″ W to 55° 20′ S, 36° 48′ 30″ W	5. ii	N 70 V	500–250	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.
337	55° 09′ S, 36° 48′ W	5. ii	N 70 V	500–250	.	.	.	.	2	.	.	.	.	.	.	8	.	.	.	.	.
337	55° 09′ S, 36° 48′ W	5. ii	N 70 V	750–500	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.
339	54° 51′ 30″ S, 36° 44′ 30″ W	5. ii	N 70 V	100–50	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
342	55° 47′ S, 34° 11′ W	7. ii	N 70 V	500–250	.	.	.	.	.	.	.	.	.	.	.	7	.	.	.	.	.
343	55° 40′ S, 34° 23′ W	7. ii	N 70 V	500–250	.	.	.	.	.	.	.	.	.	.	.	6	.	.	.	.	.
344	From 55° 33′ S, 34° 35′ 30″ W to 55° 29′ 30″ S, 34° 32′ W	7–8. ii	N 70 V	250–100	.	.	.	.	.	.	.	.	.	.	.	6	1	.	.	.	.
344	From 55° 33′ S, 34° 35′ 30″ W to 55° 29′ 30″ S, 34° 32′ W	7–8. ii	N 70 V	750–500	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.
344	From 55° 33′ S, 34° 35′ 30″ W to 55° 29′ 30″ S, 34° 32′ W	7–8. ii	N 70 V	1000–750	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.
347	55° 08′ S, 35° 14′ 30″ W	8. ii	N 70 V	100–50	.	.	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.
348	54° 53′ 30″ S, 35° 41′ 30″ W	8. ii	N 70 V	90–50	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.
349	55° 01′ S, 35° 27′ 30″ W	8. ii	N 70 V	50–0	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
349	55° 01′ S, 35° 27′ 30″ W	8. ii	N 70 V	100–50	.	.	9	.	.	.	.	.	.	.	.	.	.	.	.	.	.
350	54° 23′ S, 36° 00′ W	9. ii	N 70 V	100–50	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
353	54° 17′ 30″ S, 35° 06′ W	9. ii	N 70 V	500–250	.	.	.	.	.	.	.	.	.	.	.	4	.	.	.	.	.
353	54° 17′ 30″ S, 35° 06′ W	9. ii	N 70 V	1000–750	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.
354	From 54° 15′ 30″ S, 34° 46′ W to 54° 13′ 15″ S, 34° 46′ W	9. ii	N 70 V	500–250	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.	.	.
354	From 54° 15′ 30″ S, 34° 47′ 30″ W to 54° 13′ 15″ S, 34° 46′ W	9. ii	N 70 V	750–500	.	.	.	2	1	.	.	.	.	.	.	.	.	.	.	.	.
355	From 54° 13′ 30″ S, 34° 18′ 30″ W to 54° 10′ 30″ S, 34° 16′ 30″ W	9–10. ii	N 70 V	100–50	.	.	.	.	.	.	.	.	.	.	.	5	.	.	.	.	.
355	From 54° 13′ 30″ S, 34° 18′ 30″ W to 54° 10′ 30″ S, 34° 16′ 30″ W	9–10. ii	N 70 V	250–100	.	.	.	.	.	.	.	.	.	.	.	10	.	.	.	.	.
356	From 54° 11′ S, 33° 49′ W to 54° 08′ 45″ S, 33° 47′ 30″ W	10. ii	N 70 V	100–50	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.

356	From 54° 11′ S, 33° 49′ W to 54° 08′ 45″ S, 33° 47′ 30″ W	10. ii	N 70 V	500–250												5						
357	From 53° 07′ S, 34° 48′ W to 53° 07′ 30″ S, 34° 45′ 30″ W	10. ii	N 70 V	250–100												2						
358	From 53° 16′ 30″ S, 35° 02′ 30″ W to 53° 17′ S, 34° 58′ W	11. ii	N 70 V	250–100												4						
358	From 53° 16′ 30″ S, 35° 02′ 30″ W to 53° 17′ S, 34° 58′ W	11. ii	N 70 V	500–250												2						
358	From 53° 16′ 30″ S, 35° 02′ 30″ W to 53° 17′ S, 34° 58′ W	11. ii	N 70 V	750–500							1											
358	From 53° 16′ 30″ S, 35° 02′ 30″ W to 53° 17′ S, 34° 58′ W	11. ii	N 70 V	1000–750							1											
382	61° 27′ 30″ S, 61° 38′ 30″ W	13–14. iv	N 100 B	77–0		1																
391	55° 48′ 30″ S, 52° 35′ W	18. iv	N 450 H	1200–1300(–0)				31	1		60		2									
395	From 48° 26′ 45″ S, 22° 10′ W to 48° 26′ 30″ S, 22° 06′ 30″ W	13. v	N 450 H	1500–1600		1		18			2		1									
401	From 37° 31′ 30″ S, 04° 33′ E to 37° 29′ S, 4° 39′ 30″ E	22. v	TYFH	1200–1300				4					5									
405	From 33° 50′ 30″ S, 15° 46′ E to 34° 16′ S, 15° 02′ E	4. vi	TYFB	1200–0				2				5										
407	From 35° 13′ S, 17° 50′ 30″ E to 34° 57′ S, 17° 48′ E	12. vi	TYFB	220–0																	1	
407	From 35° 13′ S, 17° 50′ 30″ E to 34° 57′ S, 17° 48′ E	12. vi	N 200 B	275–0											1							
407	From 35° 13′ S, 17° 50′ 30″ E to 34° 57′ S, 17° 48′ E	12. vi	N 450 H	800–950				1			5	6			2							
440	From 30° 13′ 30″ S, 32° 48′ 30″ E to 30° 25′ 30″ S, 32° 48′ E	21. ix	TYFB	1000–0								9									2	
448	39° 03′ S, 16° 11′ 45″ E	10. x	N 100 B	161–0																		
454	53° 42′ S, 04° 42′ E	17. x	N 100 B	192–0		1															2	
468	54° 48′ S, 20° 41′ 30″ W	29. x 1931	TYFV	200–0										1								
568	67° 48′ 30″ S, 92° 42′ 15″ W	3. i	N 100 B	177–0					1													
569	68° 40′ 30″ S, 96° 21′ W	4. i	N 100 B	137–0													2					
588	66° 11′ 30″ S, 71° 50′ 15″ W	13. i	N 100 B	460–150					1													
589	65° 54′ S, 72° 24′ 15″ W	13–14. i	N 100 B	450–130												1						
592	64° 17′ S, 75° 31′ W	15. i	N 100 B	124–0			1															
593	64° 42′ S, 73° 33′ 30″ W	15. i	N 100 B	360–128													1					
595	65° 14′ 45″ S, 70° 26′ 30″ W	16. i	N 100 B	380–133													2					
661	From 57° 36′ S, 29° 54′ 30″ W to 57° 36′ S, 29° 35′ W	2. iv	TYFV	1000–750							1					2						
662	55° 56′ S, 29° 57′ W	3. iv	TYFB	460–0		3																
663	From 53° 34′ 30″ S, 30° 25′ 45″ W to 53° 32′ 15″ S, 30° 20′ W	4. iv	TYFB	380–0		2											1					

Table 1 (*cont.*)

'Discovery' Station	Position	Date	Gear	Depth (metres)	*Zanclonia weldoni*	*Calycopsis borchgrevinki*	*Cosmetirella davisi*	*Halicreas minimum*	*Haliscera conica*	*Rhopalonema velatum*	*Pantachogon haeckeli*	*Colobonema sericeum*	*Crossota brunnea*	*Liriope tetraphylla*	*Aegina citrea*	*Solmundella bitentaculata*	*Pegantha martagon*	*Pegantha laevis*	*Pegantha clara*	*Solmissus marshalli*	*Cunina peregrina*
		1931 (*cont.*)																			
663	From 53° 34′ 30″ S, 30° 25′ 45″ W to 53° 32′ 15″ S, 30° 20′ W	4. iv	TYFV	2000–1500	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
663	From 53° 34′ 30″ S, 30° 25′ 45″ W to 53° 32′ 15″ S, 30° 20′ W	4. iv	TYFV	1000–750	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
663	From 53° 34′ 30″ S, 30° 25′ 45″ W to 53° 32′ 15″ S, 30° 20′ W	4. iv	TYFV	500–250	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
665	51° 41′ 30″ S, 29° 58′ 45″ W	17. iv	TYFB	250–0	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.
666	From 49° 58′ 45″ S, 29° 52′ 30″ W to 49° 58′ 45″ S, 30° 13′ W	17–18. iv	TYFV	500–250	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
666	From 49° 58′ 45″ S, 29° 52′ 30″ W to 49° 58′ 45″ S, 30° 13′ W	17–18. iv	TYFV	1000–750	.	.	.	.	.	.	4	.	1	.	.	.	.	.	.	.	.
666	From 49° 58′ 45″ S, 29° 52′ 30″ W to 49° 58′ 45″ S, 30° 13′ W	17–18. iv	TYFV	3000–2000	.	.	.	.	.	.	3	.	.	.	.	.	.	.	.	.	.
666	From 49° 58′ 45″ S, 29° 52′ 30″ W to 49° 58′ 45″ S, 30° 13′ W	17–18. iv	TYFB	320–0	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
667	48° 09′ 45″ S, 29° 59′ 30″ W	18. iv	TYFB	320–0	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.
668	From 46° 42′ 30″ S, 30° 22′ W to 46° 43′ 30″ S, 30° 22′ W	19. iv	TYFV	1000–750	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.
668	From 46° 42′ 30″ S, 30° 22′ W to 46° 43′ 30″ S, 30° 22′ W	19. iv	TYFV	1500–0	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.
670	44° 52′ S, 30° 17′ W	22. iv	TYFB	470–0	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.
671	43° 08′ S, 30° 15′ 45″ W	22–23. iv	TYFV	250–0	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.
671	43° 08′ S, 30° 15′ 45″ W	22–23. iv	TYFV	500–250	.	.	.	.	.	.	5	.	.	.	.	.	.	.	.	.	.
671	43° 08′ S, 30° 15′ 45″ W	22–23. iv	TYFV	750–500	.	.	.	.	.	.	6	.	.	.	.	.	.	.	.	.	.
671	43° 08′ S, 30° 15′ 45″ W	22–23. iv	TYFV	1000–0	.	.	.	.	.	2	6	.	.	.	.	.	2	.	.	.	.
671	43° 08′ S, 30° 15′ 45″ W	22–23. iv	TYFV	1000–750	.	.	.	.	.	.	7	.	.	.	.	.	.	.	.	.	.
671	43° 08′ S, 30° 15′ 45″ W	22–23. iv	TYFV	1500–1000	.	.	.	.	.	.	4	.	1	.	.	.	.	.	.	.	.
671	43° 08′ S, 30° 15′ 45″ W	22–23. iv	TYFV	2000–1500	.	.	.	.	.	.	4	.	.	.	.	.	.	1	.	.	.
671	43° 08′ S, 30° 15′ 45″ W	22–23. iv	TYFB	360–0	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.
672	40° 25′ S, 30° 06′ W	23. iv	TYFB	200–0	.	.	.	.	.	25	.	.	.	.	.	.	.	.	.	.	.
673	From 38° 10′ 30″ S, 30° 10′ 15″ W to 38° 03′ 45″ S, 29° 48′ W	24–25. iv	TYFV	2000–1500	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.

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Table 1 (*cont.*)

'Discovery' Station	Position	Date	Gear	Depth (metres)	*Zanclonia weldoni*	*Calycopsis borchgrevinki*	*Cosmetirella davisi*	*Halicreas minimum*	*Haliscera conica*	*Rhopalonema velatum*	*Pantachogon haeckeli*	*Colobonema sericeum*	*Crossota brunnea*	*Liriope tetraphylla*	*Aegina citrea*	*Solmundella bitentaculata*	*Pegantha martagon*	*Pegantha laevis*	*Pegantha clara*	*Solmissus marshalli*	*Cunina peregrina*
		1931 (*cont.*)																			
699	14° 27′ 15″ N, 30° 02′ 15″ W	14. v	TYFV	3000–2000	·	·	·	1	·	·	·	·	·	·	·	·	·	·	·	·	·
699	14° 27′ 15″ N, 30° 02′ 15″ W	14. v	TYFB	370–0	·	·	·	·	·	3	·	·	·	5	·	·	·	·	·	1	·
700	20° 21′ 30″ N, 22° 32′ 30″ W	18. v	TYFB	2025–0	·	·	·	3	·	·	5	3	·	·	·	·	1	·	·	·	·
701	14° 39′ 18″ N, 25° 51′ 42″ W	16. x	TYFB	242–0	·	·	·	·	·	·	·	·	·	30	·	·	6	2	6	1	12
702	10° 59′ 18″ N, 27° 03′ 48″ W	17. x	TYFB	236–0	·	·	·	·	·	1	·	·	·	70	·	·	·	·	·	2	·
703	07° 17′ N, 28° 01′ 54″ W	18. x	TYFB	358–0	·	·	·	·	·	3	·	·	·	21	·	·	·	·	·	·	·
704	03° 37′ 42″ N, 29° 14′ W	19. x	TYFB	231–0	·	·	·	·	·	7	·	·	·	2	·	·	·	·	·	·	·
705	00° 03′ 24″ N, 30° 36′ 48″ W	20. x	TYFB	150–0	·	·	·	·	·	10	·	·	·	29	·	·	·	·	·	·	·
706	03° 26′ 12″ S, 32° 08′ 18″ W	21. x	TYFB	354–0	·	·	·	·	·	·	·	·	·	2	·	·	·	·	·	·	·
707	06° 44′ S, 33° 33′ W	22. x	TYFB	182–0	·	·	·	·	·	19	·	·	·	7	·	·	·	·	1	·	·
708	10° 20′ 36″ S, 34° 54′ 42″ W	23. x	TYFB	208–0	·	·	·	·	·	42	·	·	·	6	·	·	·	·	2	·	·
709	14° 01′ 24″ S, 36° 30′ 42″ W	24. x	TYFB	216–0	·	·	·	·	·	11	·	·	·	5	·	·	1	·	·	·	·
710	21° 45′ S, 39° 50′ W	26. x	TYFB	294–0	·	·	·	·	·	1	·	·	·	1	·	·	·	·	·	·	·
711	24° 40′ 42″ S, 41° 30′ 48″ W	27. x	TYFB	290–0	·	·	·	·	·	·	·	·	·	5	·	·	·	·	·	·	·
712	28° 02′ 06″ S, 43° 09′ 30″ W	28. x	TYFB	224–0	·	·	·	·	·	4	·	·	·	·	·	·	·	·	·	·	·
714	35° 09′ 30″ S, 47° 00′ W	30. x	TYFB	246–0	·	·	·	·	·	11	·	·	·	·	·	·	·	·	·	·	·
715	38° 44′ 12″ S, 49° 18′ 42″ W	31. x	TYFB	230–0	·	·	·	·	·	·	·	·	·	2	·	·	1	·	·	·	·
718	47° 27′ 12″ S, 55° 10′ 12″ W	3. xi	TYFB	262–0	·	·	·	·	·	4	·	·	·	·	·	·	·	1	·	·	·
727	56° 13′ 24″ S, 75° 07′ 18″ W	18. xi	N 100 B	124–0	2	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
769	55° 15′ 24″ S, 36° 16′ 24″ W	12. xii	N 70 V	750–500	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·	·	·
773	53° 03′ 48″ S, 37° 14′ W	15–16. xii	N 70 V	1000–750	·	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·
		1932																			
825	56° 31′ 12″ S, 36° 00′ 30″ W	28. i	N 70 B	117–0	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
847	43° 07′ 24″ S, 25° 04′ 36″ E	11. iv	N 100 B	270–196	·	·	·	·	·	1	·	·	·	·	·	·	·	·	·	·	·
903	53° 32′ S, 151° 33′ 24″ E	19–20. vi	N 100 B	131–0	·	·	·	·	·	·	·	·	·	·	·	·	2	·	·	·	·
948	54° 24′ 54″ S, 170° 13′ W	5. ix	N 100 B	115–0	·	·	·	·	·	·	·	·	·	·	·	·	2	·	·	·	·
958	61° 53′ 54″ S, 155° 42′ 24″ W	10. ix	N 100 B	260–114	·	3	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
963	52° 01′ 06″ S, 139° 13′ 12″ W	14. ix	N 100 B	320–128	·	·	·	·	·	1	·	·	·	·	·	·	·	·	·	·	·
972	59° 21′ 48″ S, 109° 59′ 30″ W	26. ix	N 100 B	300–128	·	·	·	·	·	·	·	·	·	·	·	·	1	·	·	·	·
976	59° 22′ S, 89° 03′ 54″ W	30. ix	N 100 B	73–0	·	·	·	·	·	·	·	·	·	·	·	·	2	·	·	·	·
1050	53° 46′ 36″ S, 31° 09′ 12″ W	1. xii	N 100 B	103–0	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
1056	50° 18′ S, 37° 04′ 30″ W	4. xii	N 100 B	340–150	·	·	·	·	3	·	·	·	·	·	·	·	·	·	·	·	·

		1934																
1298	From 69° 15′ 42″ S, 125° 56′ 18″ W to 69° 16′ 24″ S, 125° 36′ 18″ W	2. iii	N 450 H	1000(–0)	2	.	.	.	.	.	7	.	1	.	.	.	.	.	.	.
1370	39° 46′ 36″ S, 38° 18′ 24″ E	18. v	N 100 B	113–0	.	.	.	.	.	3	.	.	.	.	1	1	.	1	1	.	.
1371	36° 42′ 24″ S, 36° 04′ 24″ E	19. v	N 100 B	146–0	.	.	.	.	.	4	.	.	.	.	1	.	.	.	.	6	6
1372	34° 01′ 48″ S, 34° 01′ 42″ E	20. v	N 100 B	102–0	.	.	.	.	.	6	.	.		.	.	.	.	.	.	.	.
1373	31° 13′ 06″ S, 31° 48′ 42″ E	21. v	N 100 B	135–0	.	.	.	.	.	7	.	.	.	4	.	1	.	.	1	2	.
1374	31° 46′ 36″ S, 29° 46′ 18″ E	24. v	TYFB	230–0	.	.	.	.	.	16	.	.	.	3	1	.	1	.	.	3	4
1375	34° 30′ 48″ S, 26° 19′ E	25. v	TYFB	210–0	.	.	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.
1458	65° 43′ 30″ S, 97° 07′ 36″ W	4. xi	N 100 B	520–200	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		1935																
1554	38° 02′ 54″ S, 18° 39′ 42″ E	28. iii	TYFB	1500–0	.	.	.	5	.	.	.	.	.	.	.	.	.	.	.	.	.
1559	50° 07′ 12″ S, 22° 16′ 48″ E	2. iv	N 450 H	500(–0)	.	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1567	37° 50′ 06″ S, 35° 46′ 36″ E	10. iv	TYFB	1350–0	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.
1568	34° 47′ 36″ S, 34° 27′ 54″ E	11. iv	TYFB	1400–0	.	.	.	1	.	13	2	.	.	.	.	.	1	6	.	3	.
1569	31° 50′ 18″ S, 32° 20′ 30″ E	12. iv	TYFB	1200–500	.	.	.	2	.	.	9	4	.	.	.	.	.	.	.	.	.
1571	27° 24′ 18″ S, 39° 21′ 12″ E	21. iv	TYFB	500–0	.	.	.	.	.	5	.	.	.	.	.	.	.	.	.	.	.
1573	24° 35′ 36″ S, 39° 53′ 30″ E	22. iv	TYFB	800–0	.	.	.	.	.	1	.	.	.	1	.	.	.	.	.	.	.
1573	24° 35′ 36″ S, 39° 53′ 30″ E	22. iv	TYFB	2400–?	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.
1574	21° 44′ 36″ S, 40° 33′ 42″ E	23. iv	TYFB	1100–450	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.
1574	21° 44′ 36″ S, 40° 33′ 42″ E	23. iv	TYFB	600–0	.	.	.	.	.	4	.	.	.	2	.	.	1	.	.	.	.
1575	18° 33′ 12″ S, 41° 35′ 24″ E	24. iv	TYFB	800–550	.	.	.	.	.	2	.	3	.	.	1	.	.	.	.	.	.
1576	14° 42′ S, 42° 22′ 12″ E	25. iv	TYFB	1100–400	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.
1576	14° 42′ S, 42° 22′ 12″ E	25. iv	TYFB	400–0	.	.	.	.	.	4	.	.	.	.	.	.	.	.	1	.	1
1578	11° 25′ 12″ S, 42° 03′ 06″ E	26–27. iv	TYFB	1000–550	.	.	.	4	.	.	.	.	.	.	.	.	.	.	.	.	.
1580	08° 44′ 36″ S, 41° 50′ 18″ E	27. iv	TYFB	450–0	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.
1581	07° 42′ 06″ S, 44° 14′ 06″ E	28. iv	TYFB	1750–600	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.
1581	07° 42′ 06″ S, 44° 14′ 06″ E	28. iv	TYFB	600–0	.	.	.	.	.	18	.	.	.	.	.	.	1	.	.	.	.
1582	05° 39′ 06″ S, 46° 22′ 18″ E	29. iv	N 450 H	1900–1850(–0)	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.
1585	00° 06′ S, 49° 45′ 24″ E	1. v	TYFB	500–0	.	.	.	.	.	18	.	.	.	22	.	.	.	.	2	1	.
1585	00° 06′ S, 49° 45′ 24″ E	1. v	TYFB	1400–700	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.
1586	02° 39′ 24″ N, 50° 46′ 24″ E	2. v	TYFB	550–0	.	.	.	.	.	13	.	.	.	1	.	.	.	.	.	.	.
1586	02° 39′ 24″ N, 50° 46′ 24″ E	2. v	TYFB	1650–950	.	.	.	.	.	.	26	.	.	.	.	.	.	.	.	.	.
1587	06° 05′ N, 52° 00′ E	3. v	TYFB	1250–800	.	.	.	2	.	.	7	.	.	.	.	.	.	.	.	.	.
1587	06° 05′ N, 52° 00′ E	3. v	TYFB	450–0	.	.	.	.	.	11	.	.	.	.	.	.	.	.	.	.	.
1600	12° 43′ 18″ S, 00° 20′ 12″ E	25. x	TYFB	400–330	.	.	.	2	.	.	.	1	.	.	.	.	.	.	.	.	.
1602	17° 59′ 54″ S, 04° 27′ 06″ E	27. x	TYFB	175–0	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.
1604	21° 34′ 24″ S, 08° 09′ 48″ E	29. x	TYFB	620–500	.	.	.	.	.	.	.	3	.	.	.	.	.	.	.	.	.
1606	26° 15′ 48″ S, 12° 18′ E	31. x	TYFB	600–500	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	2	.
1606	26° 15′ 48″ S, 12° 18′ E	31. x	TYFB	190–0	.	.	.	.	.	.	.	.	.	.	.	1	2	.	.	.	.
1633	56° 35′ 42″ S, 78° 07′ 48″ E	29. xi	TYFB	1100–875	.	.	.	.	.	.	4	.	1	.	.	.	.	.	.	.	.
1639	58° 35′ S, 92° 06′ 12″ E	2. xii	TYFB	2400–1150	.	.	.	1	.	.	.	.	1	.	.	.	.	.	.	.	.
1639	58° 35′ S, 92° 06′ 12″ E	2. xii	N 70 B	2400–1150	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.

Table 1 (*cont.*)

'Discovery' Station	Position	Date 1936	Gear	Depth (metres)	*Zanclonia weldoni*	*Calycopsis borchgrevinki*	*Cosmetirella davisi*	*Halicreas minimum*	*Haliscera conica*	*Rhopalonema velatum*	*Pantachogon haeckeli*	*Colobonema sericeum*	*Crossota brunnea*	*Liriope tetraphylla*	*Aegina citrea*	*Solmundella bitentaculata*	*Pegantha martagon*	*Pegantha laevis*	*Pegantha clara*	*Solmissus marshalli*	*Cunina peregrina*
1707	63° 36′ 54″ S, 129° 24′ 42″ E	19. iii	TYFB	1150–800	.	.	.	1	.	.	2	.	5	.	.	.	.	.	.	.	.
1718	64° 22′ 36″ S, 106° 33′ 18″ E	25. iii	TYFB	900–550	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.
1719	64° 15′ 30″ S, 104° 03′ 24″ E	25. iii	N 100 B	128–0	.	.	1	.	.	.	.	.	1	.	.	.	.	.	.	.	.
1728	53° 14′ 54″ S, 107° 02′ E	31. iii	TYFB	800–350	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.
1741	From 32° 01′ 06″ S, 101° 59′ 06″ E to 32° 01′ 06″ S, 101° 47′, 54″ E	18. iv	N 450 B	1550–900	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.
1743	32° 01′ 30″ S, 93° 40′ 24″ E	20. iv	N 450 B	1150–0	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.
1743	32° 01′ 30″ S, 93° 40′ 24″ E	20. iv	N 450 B	2100–1150	.	.	.	.	.	.	2	1	.	.	.	.	.	.	.	.	.
1745	32° 03′ 54″ S, 88° 56′ 54″ E	21. iv	TYFB	1600–800	.	.	.	.	.	.	1	.	1	.	.	.	.	.	.	.	.
1747	31° 51′ 36″ S, 83° 35′ 54″ E	23. iv	N 450 B	1250–400	.	.	.	1	.	.	.	1	.	.	.	.	.	.	.	.	.
1749	32° 04′ 06″ S, 77° 59′ 36″ E	24. iv	TYFB	1050–600	.	.	.	1	.	.	.	.	.	.	1	.	.	.	.	.	.
1749	32° 04′ 06″ S, 77° 59′ 36″ E	24. iv	TYFB	450–0	.	.	.	.	.	2	.	.	.	.	.	.	.	.	2	.	.
1750	From 32° 12′ S, 75° 32′ 36″ E to 32° 13′ 54″ S, 75° 21′ 30″ E	25. iv	N 450 B	1900–0	.	.	.	2	.	.	.	1	2	.	.	.	.	.	.	.	.
1750	From 32° 12′ S, 75° 32′ 36″ E to 32° 13′ 54″ S, 75° 21′ 30″ E	25. iv	N 450 H	2000–1900	.	.	.	.	.	.	7	1	.	.	.	.	.	.	.	.	.
1751	32° 07′ 54″ S, 72° 15′ 42″ E	26. iv	N 450 H	900–850	.	.	.	.	.	.	11	15	.	.	.	.	.	.	.	.	.
1753	32° 00′ 24″ S, 68° 50′ 54″ E	27. iv	TYFB	2900–1400	.	.	.	2	.	.	4	1	.	.	.	.	.	.	.	.	.
1754	31° 48′ 54″ S, 65° 30′ 18″ E	28. iv	TYFB	900–400	.	.	.	2	.	.	.	4	.	.	.	.	.	.	.	.	.
1755	From 32° 00′ 36″ S, 62° 11′ 42″ E to 32° 00′ 36″ S, 62° 03′ 12″ E	29. iv	N 450 B	1700–0	.	.	.	.	.	.	.	8	.	.	.	.	.	.	.	.	.
1755	From 32° 00′ 36″ S, 62° 11′ 42″ E to 32° 00′ 36″ S, 62° 03′ 12″ E	29. iv	N 450	2200–2400(–1700)	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.
1757	31° 58′ 12″ S, 57° 20′ 18″ E	30. iv	N 450 H	470–450	.	.	.	4	.	.	.	.	.	.	.	.	.	.	.	.	.
1757	31° 58′ 12″ S, 57° 20′ 18″ E	30. iv	N 450 B	470–0	.	.	.	.	.	.	.	5	.	.	.	.	.	.	.	.	.
1758	From 31° 55′ 36″ S, 55° 06′ 30″ E to 31° 55′ S, 55° 05′ 06″ E	1. v	N 450 B	650–0	.	.	.	7	.	.	1	35	2	.	.	.	.	.	.	.	.
1758	From 31° 55′ 36″ S, 55° 06′ 30″ E to 31° 55′ S, 55° 05′ 06″ E	1. v	N 450 B	1400–650	.	.	.	2	.	.	.	7	.	.	.	.	.	.	.	.	.
1759	31° 54′ 30″ S, 51° 27′ 54″ E	2. v	N 450 B	1150–0	.	.	.	.	.	.	.	16	.	.	.	.	1	.	.	.	.
1761	32° 03′ 30″ S, 47° 59′ 48″ E	3. v	TYF 70 B	1800–650	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.
1762	31° 57′ 18″ S, 44° 23′ 12″ E	4. v	TYF 70 B	850–600	.	.	.	1	.	.	2	5	.	.	.	.	.	.	.	.	.

1765	From 32° 00′ 36″ S, 33° 46′ 54″ E to 32° 00′ 48″ S, 33° 42′ E	7. v	TYF 70 B	1350–800							1	1											
1766	From 31° 54′ 42″ S, 29° 48′ 06″ E to 32° 00′ S, 29° 43′ 18″ E	8. v	N 450 B	1200–600				2				2											
1768	33° 49′ 48″ S, 12° 50′ 48″ E	19. v	N 100 B	90–0																		1	
1770	33° 49′ 06″ S, 05° 10′ 48″ E	21. v	N 70 V	1000–750				1															
1770	33° 49′ 06″ S, 05° 10′ 48″ E	21. v	N 100 B	100–0						1													2
1776	From 47° 43′ S, 00° 25′ 30″ E to 47° 48′ S, 00° 23′ 36″ E	28. v	N 70 V	1000–750									1										
1784	57° 07′ 18″ S, 04° 29′ 12″ E	4. vi	TYF 70 B	800–400							1		1										
1808	From 41° 36′ 30″ S, 00° 28′ 36″ E to 41° 36′ 06″ S, 00° 28′ 30″ E	22. ix	N 70 V	1000–750				×															
1825	From 55° 42′ 48″ S, 14° 44′ 06″ W to 55° 44′ 12″ S, 14° 50′ 54″ W	5. x	TYF 70 B	1150–600							5		2										
1863	57° 10′ 18″ S, 42° 29′ 18″ W	8. xi	TYFB	1000–500				×															
1876	58° 37′ 42″ S, 54° 54′ 24″ W	14. xi	TYFB	1550–1100							1												
1917	53° 48′ 42″ S, 46° 27′ 42″ W	3. xii	TYFB	1400–1000				1			2		1										
1919	54° 02′ 54″ S, 42° 10′ 48″ W	4. xii 1937	TYFB	1800–1300				2			1												
1944	57° 43′ 30″ S, 43° 45′ 12″ W	2. i	TYFB	1500–1200				1															
1970	55° 03′ S, 54° 04′ 12″ W	18. ii	TYFB	1800–1500				1					1										
1972	52° 11′ S, 52° 33′ 42″ W	28. ii	TYFB	2100–1400				1			1												
1974	52° 58′ 24″ S, 48° 20′ 24″ W	1. iii	TYFB	1600–1000				4					1										
1981	52° 49′ 42″ S, 36° 56′ 30″ W	4. iii	N 70 V	1000–750				1															
1989	55° 53′ 12″ S, 32° 46′ 48″ W	10. iii	TYFB	1500–1200				×			1												
1991	57° 54′ 42″ S, 30° 25′ 36″ W	11. iii	TYFB	1500–1000				×			1												
1995	61° 21′ 06″ S, 25° 49′ 12″ W	13. iii	TYFB	1800–1300				×															
1999	64° 55′ 54″ S, 22° 08′ 06″ W	15. iii	N 100 B	1000–500				×															
2001	67° 04′ 24″ S, 19° 41′ W	16. iii	TYFB	1750–1300				×															
2006	66° 16′ 42″ S, 13° 23′ 18″ W	19. iii	TYFB	1750–1400				×															
2008	66° 06′ 30″ S, 06° 45′ 36″ W	20. iii	TYFB	1500–1300				1															
2031	33° 57′ 12″ S, 09° 22′ 12″ E	5. iv	TYFB	1800–1550							2												
2033	33° 54′ S, 12° 31′ 12″ E	6. iv	TYFB	1350–1250				5			1												
2033	33° 54′ S, 12° 31′ 12″ E	6. iv	N 100 H	0–5										2									
2035	33° 57′ 12″ S, 16° 12′ 12″ E	7. iv	TYFB	950–750				2			3												
2036	33° 45′ 30″ S, 15° 03′ 48″ E	17. iv	TYFB	2650–2200							1												
2038	33° 29′ 12″ S, 06° 37′ 54″ E	19. iv	TYFB	1200–850				2															
2040	33° 54′ 06″ S, 00° 08′ 48″ E	21. iv	TYFB	600–0				1															
2042	31° 40′ 30″ S, 00° 28′ 24″ W	22. iv	TYFB	2800–2300				1					1										
2044	28° 38′ S, 01° 11′ 12″ W	23. iv	N 450 B	550–750				×			2												
2047	24° 53′ 54″ S, 01° 43′ 30″ W	24. iv	N 100 H	0–5										3									
2047	24° 53′ 54″ S, 01° 43′ 30″ W	24. iv	TYFB	1300–900							1												
2048	23° 16′ S, 01° 51′ 42″ W	25. iv	N 450 B	600–0				1			2		2										
2053	17° 45′ 42″ S, 02° 49′ 48″ W	27. iv	N 450 B	500–0																		3	
2053	17° 45′ 42″ S, 02° 49′ 48″ W	27. iv	TYFB	900–550				1					1		1							1	

× = present but numbers not known.

Table 1 (*cont.*)

'Discovery' Station	Position	Date 1936 (*cont.*)	Gear	Depth (metres)	*Zanclonia weldoni*	*Calycopsis borchgrevinki*	*Cosmetirella davisi*	*Halicreas minimum*	*Haliscera conica*	*Rhopalonema velatum*	*Pantachogon haeckeli*	*Colobonema sericeum*	*Crossota brunnea*	*Liriope tetraphylla*	*Aegina citrea*	*Solmundella bitentaculata*	*Pegantha martagon*	*Pegantha laevis*	*Pegantha clara*	*Solmissus marshalli*	*Cunina peregrina*
2055	14° 55′ 48″ S, 03° 39′ 42″ W	28. iv	TYFB	2000–1400	·	·	·	×	·	·	·	·	·	·	·	·	·	·	·	·	·
2057	12° 09′ S, 04° 28′ 12″ W	29. iv	N 450 B	1450–700	·	·	·	×	·	·	·	1	·	·	2	·	·	·	·	·	·
2059	09° 11′ 24″ S, 05° 17′ 24″ W	30. iv	N 450 B	1400–0	·	·	·	·	·	·	·	1	·	·	·	·	·	·	2	·	·
2059	09° 11′ 24″ S, 05° 17′ 24″ W	30. iv	N 450 B	1900–1400	·	·	·	1	·	·	·	3	·	·	·	·	·	·	·	·	·
2061	06° 36′ S, 06° 25′ 06″ W	1. v	N 450 B	1500–0	·	·	·	·	·	·	·	2	·	·	·	·	·	·	·	·	·
2061	06° 36′ S, 06° 25′ 06″ W	1. v	N 450 B	1900–1500	·	·	·	×	·	·	·	·	1	·	·	·	·	·	·	1	·
2063	03° 24′ 48″ S, 07° 51′ 12″ W	2. v	N 450 B	600–0	·	·	·	5	·	·	·	·	·	·	·	·	·	·	·	·	·
2063	03° 24′ 48″ S, 07° 51′ 12″ W	2. v	N 450 B	1150–600	·	·	·	23	·	·	×	8	·	·	·	·	·	·	·	·	·
2064	00° 46′ 54″ S, 10° 11′ 30″ W	3. v	N 450 B	1600–1050	·	·	·	8	·	·	4	1	·	·	1	·	·	·	·	·	·
2065	02° 07′ 54″ N, 12° 30′ 30″ W	4. v	N 450 B	1600–1400	·	·	·	·	·	·	8	·	·	·	·	·	·	·	·	·	·
2066	04° 56′ 24″ N, 14° 46′ 42″ W	5. v	N 450 B	1950–1550	·	·	·	4	·	·	·	·	·	·	·	·	·	·	1	·	·
2067	24° 12′ N, 21° 12′ 12″ W	12. v	N 450 H	68(–0)	·	·	·	·	·	·	·	·	·	·	·	·	·	1	·	·	1
2068	27° 26′ 24″ N, 19° 30′ 36″ W	13. v	N 450 B	700–0	·	·	·	·	·	·	·	·	·	·	·	·	·	·	1	·	·
2069	30° 46′ 18″ N, 17° 50′ 12″ W	14. v	N 450 H	0–5	·	·	·	·	·	·	·	·	·	·	·	·	·	·	3	·	·
2070	39° 33′ 18″ N, 12° 07′ 36″ W	20. v	TYFH	30	·	·	·	·	·	·	·	·	·	·	1	·	·	·	·	·	·

'William Scoresby' Station	Position	1926	Gear	Depth (metres)	*Zanclonia weldoni*	*Calycopsis borchgrevinki*	*Cosmetirella davisi*	*Halicreas minimum*	*Haliscera conica*	*Rhopalonema velatum*	*Pantachogon haeckeli*	*Colobonema sericeum*	*Crossota brunnea*	*Liriope tetraphylla*	*Aegina citrea*	*Solmundella bitentaculata*	*Pegantha martagon*	*Pegantha laevis*	*Pegantha clara*	*Solmissus marshalli*	*Cunina peregrina*
WS 20	53° 52′ 30″ S, 36° 00′ 00″ W	28. xi	N 100 H	190	,	1	,	,	,	,	,	,	,	,	,	,	,	,	,	,	,
WS 21	53° 45′ 30″ S, 35° 48′ 00″ W	28. xi	N 100 H	192	1	,	,	,	,	,	,	,	,	,	,	,	,	,	,	,	,
WS 22	53° 38′ 00″ S, 35° 35′ 00″ W	30. xi	N 100 H	185	1	,	,	,	,	,	,	,	,	,	,	,	,	,	,	,	,
WS 28	53° 48′ 15″ S, 38° 13′ 00″ W	19. xii	N 100 H	80	,	,	,	,	,	,	,	,	,	,	,	,	1	,	,	,	,
WS 29	53° 41′ 15″ S, 38° 24′ 45″ W	19. xii	N 70 V	500–250	,	,	,	,	,	,	1	,	,	,	,	,	,	,	,	,	,
WS 29	53° 41′ 15″ S, 38° 24′ 45″ W	19. xii	N 70 V	250–100	,	,	,	,	1	,	,	,	,	,	,	,	,	,	,	,	,
WS 29	53° 41′ 15″ S, 38° 24′ 45″ W	19. xii	N 70 H	132–66(–0)	1	,	,	,	,	,	,	,	,	,	,	,	,	,	,	,	,
WS 30	53° 34′ 15″ S, 38° 36′ 15″ W	19–20. xii	N 70 V	250–100	,	,	,	,	1	,	,	,	,	,	,	,	,	,	,	,	,
WS 30	53° 34′ 15″ S, 38° 36′ 15″ W	19–20. xii	N 100 H	67	,	,	,	,	,	,	,	,	,	,	,	2	,	,	,	,	,
WS 35	55° 13′ 15″ S, 34° 59′ 00″ W	21–22. xii	N 100 H	51	,	,	,	,	,	,	,	,	,	,	,	,	1	,	,	,	,
WS 36	55° 20′ 15″ S, 34° 46′ 30″ W	22. xii	N 70 V	750–500	,	,	,	,	,	,	1	,	,	,	,	,	,	,	,	,	,
WS 37	54° 45′ 00″ S, 35° 11′ 00″ W	22. xii	N 70 V	250–100	,	1	,	,	,	,	,	,	,	,	,	,	,	,	,	,	,

| | | |

Table 2. *Geographical distribution of neritic species of Leptolina collected by the* Discovery *Investigations*, 1926–37

	Antarctic																			
	Pacific sector	Atlantic sector	Indian sector	W. Atlantic-antiboreal	W. Atlantic-tropical	W. Atlantic-boreal	Arctic	E. Atlantic-boreal	Mediterranean-Atlantic	E. Atlantic-tropical	S. African	E. African-tropical	Indo-West Pacific-tropical	Indian temperate	S. Australian-New Zealand	Pacific-boreal	E. Pacific-tropical	Peru-N. Chilensic
Koellikerina maasi	○	×	○	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Zanclonia weldoni	⊗	×	○	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Calycopsis borchgrevinki	⊗	⊗	○	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ptychogena antarctica	○	×	○	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Mitrocomella frigida	○	⊗	○	.	.	.	.	.	.	.	×	.	.	.	.	.	.	.
Cosmetirella davisi	⊗	⊗	⊗	⊗	.	.	.	.	.	.	⊗	.	.	.	.	.	.	.
Bougainvillia macloviana	.	.	○	⊗	.	.	.	○	.	.	.	.	.	.	○	.	.	.
Tiaricodon coeruleus	.	○	.	⊗	.	.	.	.	.	.	.	.	.	.	.	.	.	○
Aglauropsis conanti	.	.	.	⊗	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Proboscidactyla mutabilis	.	.	.	⊗	.	.	.	.	.	.	.	.	?	.	.	.	.	.
Laodicea pulchra	.	.	.	⊗	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Phialella falklandica	.	.	.	⊗	.	.	.	.	.	.	.	.	.	.	○	.	.	○
Sarsia gracilis	.	.	.	○	.	.	.	.	.	.	×	.	.	.	.	.	.	.
Halitholus intermedius	.	.	.	○	.	.	.	.	.	.	×	.	.	.	.	.	.	.
Phialidium simplex	.	.	.	○	○	.	.	.	.	.	×	.	○	.	.	.	.	.
Gossea brachymera	.	.	.	×	○	.	.	.	.	.	.	.	.	.	.	.	○	.
Aequorea coerulescens	.	.	.	×	.	.	.	.	.	.	○	.	.	.	.	○	○	⊗
Pandea conica	.	.	.	×	○	.	.	.	○	⊗	○	.	○	.	.	.	.	.
Aequorea macrodactyla	.	.	.	×	.	.	.	○	.	×	⊗	○	○	.	.	.	○	×
Aequorea aequorea	.	.	.	×	○	○	.	○	○	○	×	.	.	.	.	?	.	.
Laodicea undulata	.	.	.	○	⊗	○	.	○	○	○	×	.	.	.	.	.	.	.
Halopsis ocellata	.	.	.	×	.	○	○	○	.	.	.	.	.	.	.	.	.	.
Staurophora mertensi	.	×	.	⊗	.	○	○	○	.	.	.	.	.	.	.	○	.	.
Leuckartiara octona	.	.	.	.	.	○	.	○	○	×	.	.	○	.	.	○	.	.
Neoturris pileata	.	.	.	.	.	.	.	○	○	.	×	.	.	.	.	?	.	.
Heterotiara minor	.	.	.	.	.	.	.	.	.	.	×	.	○	.	.	.	.	.
Zygocanna vagans	.	.	.	.	.	.	.	.	.	.	×	.	○	.	.	.	○	.
Phialidium discoidum	.	.	.	.	⊗	.	.	.	.	.	.	.	.	.	.	.	.	.
Octophialucium medium	.	.	.	.	.	.	.	.	.	⊗	.	.	.	.	.	.	.	.
Octophialucium aphrodite	.	.	.	.	.	.	.	.	.	.	.	×	○	.	.	.	.	.
Number of species:																		
× new to the regions	0	4	0	6	0	0	0	0	0	2	9	1	0	0	0	0	0	1
⊗ present + previous records	3	3	1	8	2	0	0	0	0	2	2	0	0	0	0	0	0	1
○ previous records only	3	1	6	4	4	5	2	8	5	2	2	1	7	0	2	3	4	2

Table 3. *Geographical distribution of oceanic species of Hydromedusae, predominantly epipelagic, collected by the* Discovery *Investigations*, 1926–37

	Antarctic															
	Pacific sector	Atlantic sector	Indian sector	W. Atlantic-antiboreal	W. Atlantic-tropical	W. Atlantic-boreal	Arctic	E. Atlantic-boreal	Mediterranean-Atlantic	E. Atlantic-tropical	S. African	E. African-tropical	Indo-West Pacific-tropical	Indo-West Pacific-antiboreal	Pacific-boreal	E. Pacific warm-water
LEPTOLINA																
Bougainvillia platygaster	.	.	.	.	⊗	.	.	.	.	○	×	×	.	.	.	.
Cytaeis tetrastyla	.	.	.	.	⊗	.	.	.	○	⊗	.	○ ×	○	.	.	○
Euphysora furcata	.	.	.	.	.	○	.	.	.	⊗	×	×	.	.		
Phialopsis diegensis	.	.	.	.	×	○	.	○	.	⊗	×	×	.	.	○	○
TRACHYLINA																
Solmundella bitentaculata	⊗	⊗	○	⊗	⊗	.	.	.	○	⊗	⊗	○	○	.	○	○
Pegantha martagon	×	×	.	×	×	.	.	.	×	⊗	×	×	○	×	.	○
Rhopalonema velatum	.	.	.	×	⊗	○	.	○	○	⊗	⊗	⊗	○	⊗	.	○
Aegina citrea	.	.	.	⊗	⊗	○	.	○	⊗	⊗	⊗	○	○	⊗	○	○
Liriope tetraphylla	.	.	.	×	×	○	.	○	○	⊗	⊗	⊗	○	.	.	⊗
Persa incolorata	.	.	.	○	○	.	.	.	○	⊗	○	.	.	.	.	.
Cunina duplicata	.	.	.	×	.	.	.	.	.	⊗	×	×	.	.	.	.
Pegantha laevis	.	.	.	×	×	.	.	.	.	⊗	×	.	.	.	.	○
Pegantha clara	.	.	.	.	⊗	○	.	.	⊗	×	×	×	○	×	.	○
Aglaura hemistoma	.	.	.	.	⊗	○	.	.	○	⊗	⊗	○	○	.	.	○
Cunina octonaria	.	.	.	.	⊗	○	.	.	○	⊗	⊗	○	○	.	.	○
Cunina frugifera	.	.	.	.	×	.	.	.	○	⊗	×	×	.	.	.	.
Pegantha triloba	.	.	.	.	○	.	.	.	○	⊗	.	○	○	.	.	○
Pegantha rubiginosa	.	.	.	.	○	.	.	.	○	⊗	.	.	.	.	.	.
Sminthea eurygaster	.	.	.	.	○	.	.	.	○	⊗	×	.	○	.	.	.
Geryonia proboscidalis	.	.	.	.	⊗	.	.	.	○	⊗	⊗	⊗	○	.	.	○
Cunina peregrina	.	.	.	.	⊗	.	.	.	.	⊗	×	×	○	.	.	○
Solmissus marshalli	.	.	.	.	×	.	.	.	.	⊗	×	⊗	○	.	.	○
Solmaris corona	.	.	.	.	.	.	.	○	○	○	×	.	?	.	.	.
Cunina globosa	.	.	.	.	.	.	.	.	.	.	×	.	.	.	.	○
Number of species:																
× new to the regions	1	1	0	5	6	0	0	0	1	1	13	8	0	2	0	0
⊗ present + previous records	1	1	0	2	10	0	0	0	2	20	7	4	0	2	0	1
○ previous records only	0	0	1	1	4	8	0	5	13	2	1	6	14	0	3	15

Table 4. *Geographical distribution of oceanic species of Hydromedusae, predominantly bathypelagic, collected by the* Discovery *Investigations*, 1926–37

	Antarctic											
	Pacific sector	Atlantic sector	Indian sector	N. Atlantic-boreal	Atlantic warm-water	S.W. Atlantic-antiboreal	S. African	E. African-tropical	Indian warm-water	Indian-temperate	Pacific-boreal	Pacific warm-water
LEPTOLINA												
Pandea rubra	.	×	.	○	○	.	×	.	.	.	○	.
Chromatonema rubrum	.	×	×	○	○	.	×	.	.	.	.	.
Tiaranna rotunda	.	.	×	○	⊗	×	.	.	.	.	.	.
Annatiara affinis	.	.	.	○	⊗	.	×	.	.	.	.	.
Bythotiara murrayi	.	.	.	○	○	.	×	.	?	.	.	.
Calycopsis bigelowi	.	.	.	.	.	.	×	○	.	.	.	.
TRACHYLINA												
Haliscera racovitzae	○	⊗	.	.	.	.	.	.	.	.	.	.
Arctapodema antarcticum	.	×	⊗	.	.	.	.	.	.	×	.	.
Arctapodema australe	.	.	○	.	.	.	.	.	.	×	.	.
Arctapodema amplum	.	⊗	○	.	○	.	.	.	.	.	.	.
Crossota brunnea	×	⊗	⊗	.	⊗	⊗	⊗	⊗	○	×	.	○
Haliscera conica	×	⊗	○	.	⊗	⊗	⊗	.	.	.	.	.
Pantachogon haeckeli	×	×	⊗	○	⊗	⊗	⊗	⊗	○	×	○	○
Halicreas minimum	.	⊗	×	○	⊗	×	⊗	⊗	○	×	○	○
Botrynema brucei	.	⊗	⊗	○	⊗	.	⊗	.	○	⊗	○	.
Rhopalonema funerarium	.	.	.	○	⊗	×	×	.	○	.	.	○
Colobonema sericeum	.	.	.	○	⊗	.	⊗	×	○	⊗	.	○
Aeginura grimaldii	.	.	.	○	⊗	.	○	⊗	○	.	○	○
Halitrephes maasi	.	.	.	.	⊗	.	⊗	×	○	×	.	○
Crossota alba	.	.	.	.	×	.	.	.	.	.	○	.
Tetrorchis erythrogaster	.	.	.	.	⊗	.	×	.	.	.	.	○
Number of species:												
× new to the regions	3	4	3	0	1	3	7	2	0	6	0	0
⊗ present + previous records	0	6	4	0	12	3	7	4	0	2	0	0
○ previous records only	1	0	3	11	4	0	1	1	8	0	6	8

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PLATE I

Fig. 1. *Corymorpha* sp. St. 256. ×30.

Fig. 2. *Euphysora furcata* Kramp. Specimen with contracted tentacle. St. 1604. ×10.

Figs. 3, 4. *Euphysora gigantea* sp.n.

Fig. 3. Type specimen. St. 1995. ×4.

Fig. 4. One of the bifurcated branches of the tentacle.

Fig. 5. *Rathkea africana* sp.n. Type specimen. St. 282. ×40.

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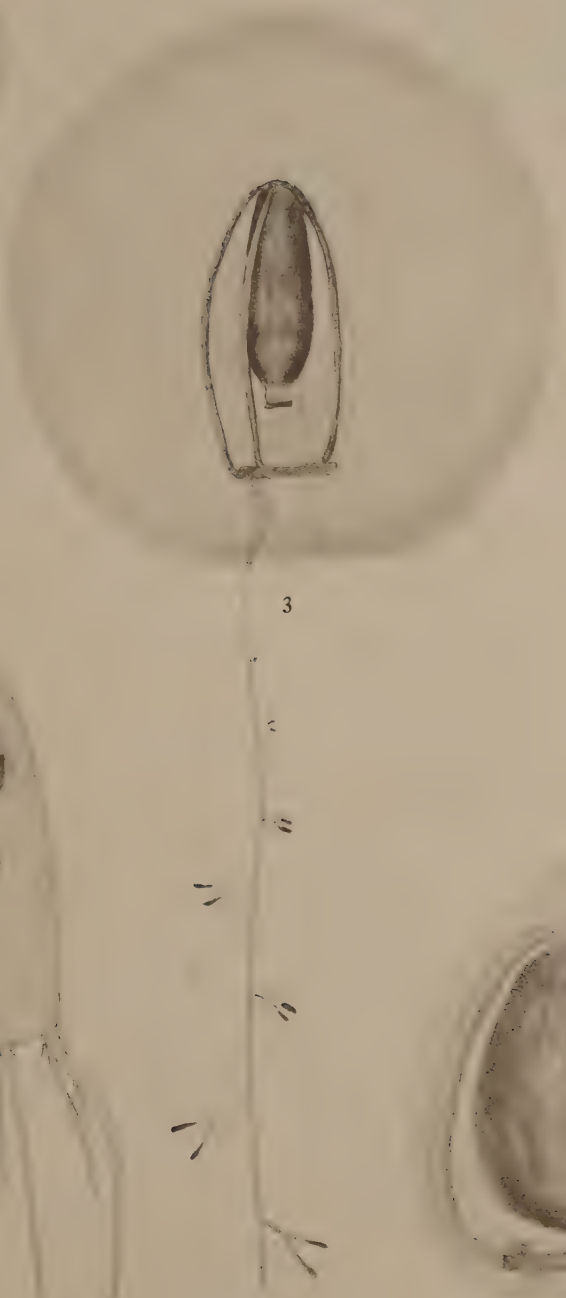

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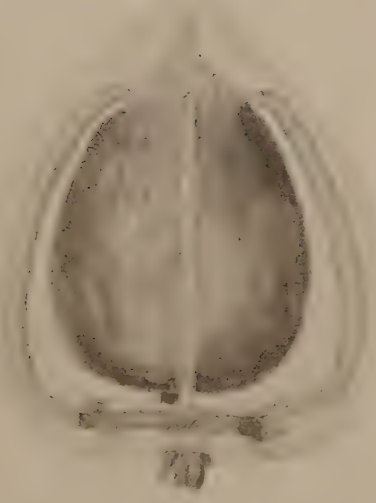

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PLATE II

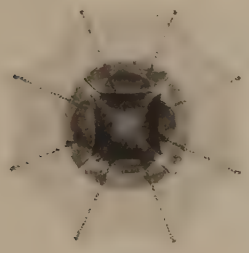
Figs. 1–3. *Ectopleura sacculifera* sp.n. Type specimen. St. WS 720. × 30. Fig. 1, lateral view. Fig. 2, aboral view. Fig. 3, oral view.

Fig. 4. *Merga rubra* sp.n. Type specimen (the mouth region is lacking). St. 661. × 10.

Figs. 5, 6. *Leuckartiara annexa* sp.n.

Fig. 5. Type specimen. St. 439. × 10.

Fig. 6. Adradial tentacle.



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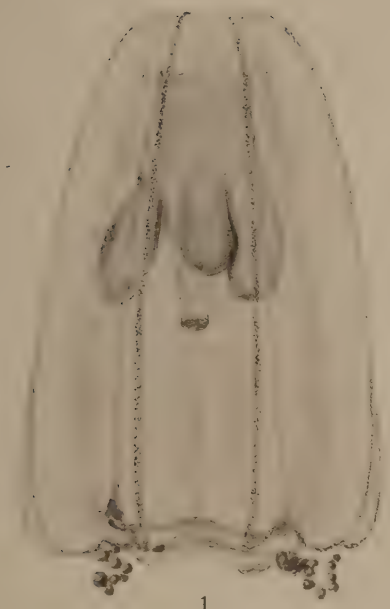

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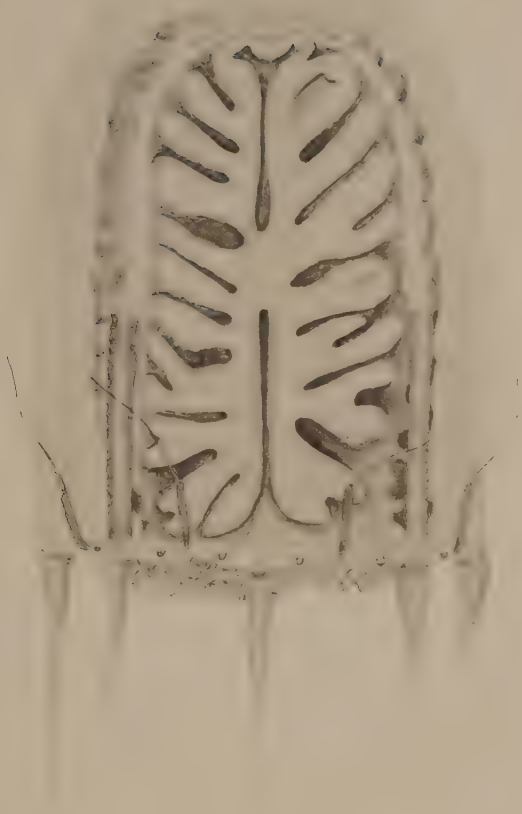

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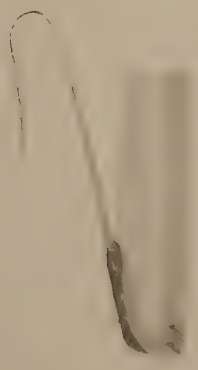

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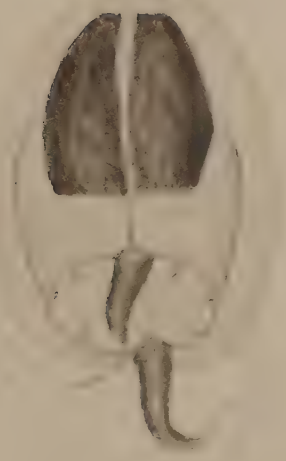

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PLATE III

Figs. 1–6. *Bougainvillia platygaster* (Haeckel).

Fig. 1. Aboral view of stomach with male gonads. St. 1374. ×30.

Fig. 2. Aboral view of stomach. Medusa buds are developed on the pedicels of hydranths issuing from the corners of the stomach. St. 1581.

Figs. 3–5. Hydranths developed by budding from the corners of the stomach; medusa buds issuing from the pedicels of the hydranths. The hydranth in fig. 5 has swallowed a copepod. St. 1374. ×65.

Fig. 6. Medusa buds on a stolon without a hydranth. The stolon, issuing from one of the corners of the stomach, was adnate to the subumbrella. St. 1581. ×65.

Fig. 7. *Proboscidactyla ornata* (McCrady). Blastostyle with medusa buds; from a medusa taken in Philippine waters by the 'Galathea' Expedition. ×65.

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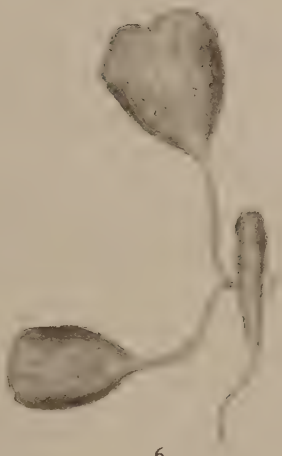

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PLATE IV

Figs. 1–6. *Russellia mirabilis* gen.n., sp.n.

Fig. 1. Type specimen. St. 587 (filiform parts of tentacles added from another specimen). × 6.

Fig. 2. Internal view of perradial edge of the stomach. St. 1871.

Fig. 3. Oral tentacle and part of mouth rim. St. 1871.

Fig. 4. One-quarter of the umbrella-margin from below, with the roots of three tentacles, each flanked by two dwarf tentacles. St. 1871.

Figs. 5, 6. Tentacle root. St. 1871. Fig. 5, lateral view. Fig. 6, frontal view.

Fig. 7. *Laodicea pulchra* Browne. Gonad and part of the umbrella-margin, aboral view. St. 1897. × 10.

Fig. 8. *Ptychogena antarctica* Browne. Aboral view of gonad; distal end upwards. St. 1959. × 4.

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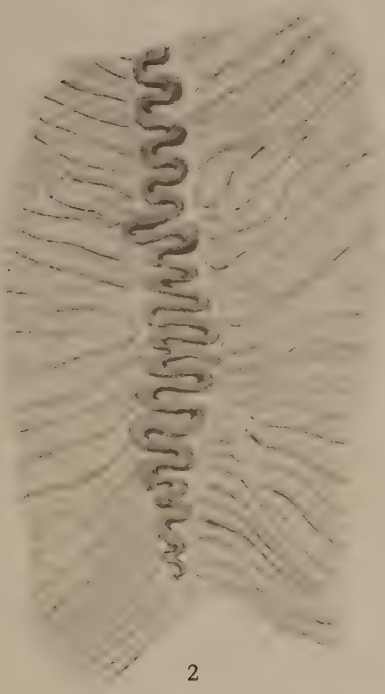

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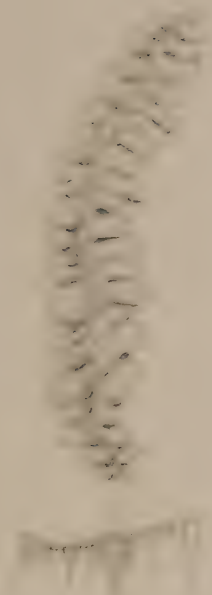

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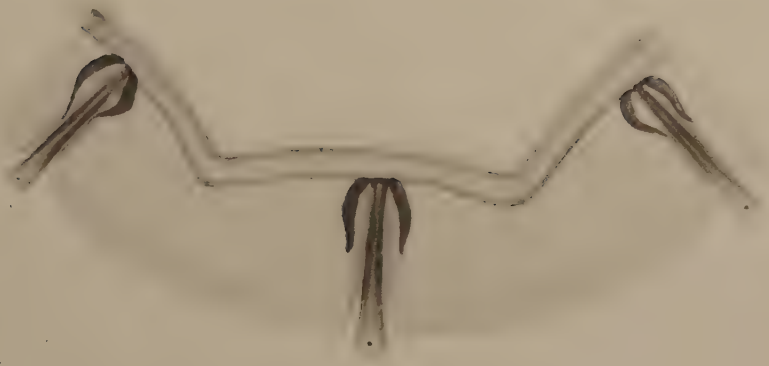

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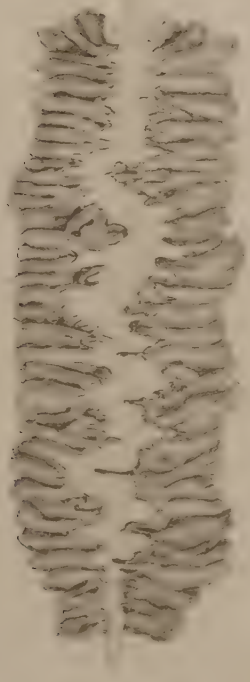

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PLATE V

Fig. 1. *Eucheilota* sp. Oral view. St. 91. ×30.

Figs. 2, 3. *Gossea brachymera* Bigelow. Interradial marginal swelling with the root of a tentacle, an internal statocyst, and a dwarf tentacle with its three endodermal roots. St. 833. Fig. 2 seen from above through the exumbrellar jelly. Fig. 3, frontal view.

Fig. 4. *Arctapodema amplum* (Vanhöffen). Aboral view of stomach with large gonads in radial lobes of the stomach and small additional gonads on the radial canals. St. WS 160.

Figs. 5, 6. *Arctapodema australe* (Vanhöffen). St. 1753.

Fig. 5. Oral view of stomach turned inside out, showing the internal surface; surrounded by eight gonads on the radial canals.

Fig. 6. Aboral view of part of the stomach and two gonads hanging below the radial canals.

Fig. 7. *Amphogona apicata* sp.n. Type specimen. St. 102. (Stomach from another specimen, St. 1575.) ×12.

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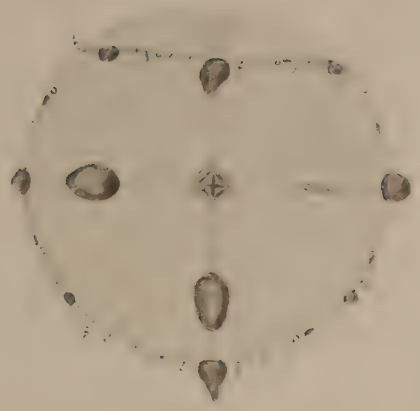

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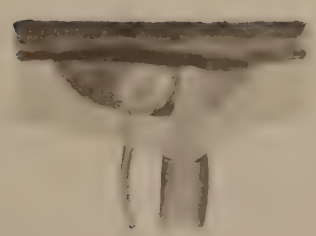

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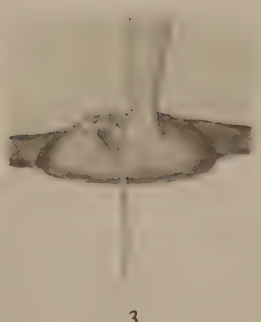

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PLATE VI

Figs. 1–4. Marginal lappets of four species of *Pegantha*, showing the difference in the peripheral canals and the otoporpae.

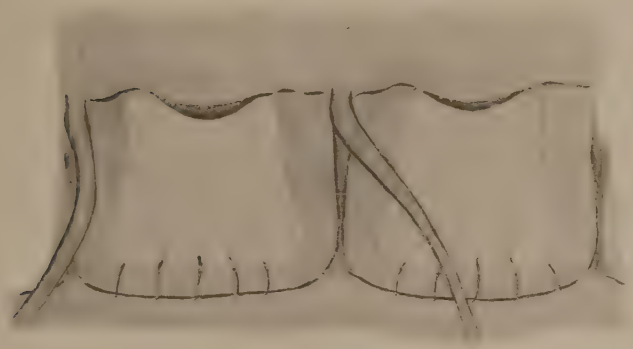
Fig. 1. *Pegantha martagon* Haeckel. St. 129.

Fig. 2. *Pegantha laevis* H. B. Bigelow. St. 1565.

Fig. 3. *Pegantha clara* R. P. Bigelow. St. 697.

Fig. 4. *Pegantha rubiginosa* (Kölliker). 'Atlantide'. St. 83.

Fig. 5. *Cunina duplicata* Maas. Aboral view of a specimen 50 mm. in diameter. St. 1974.



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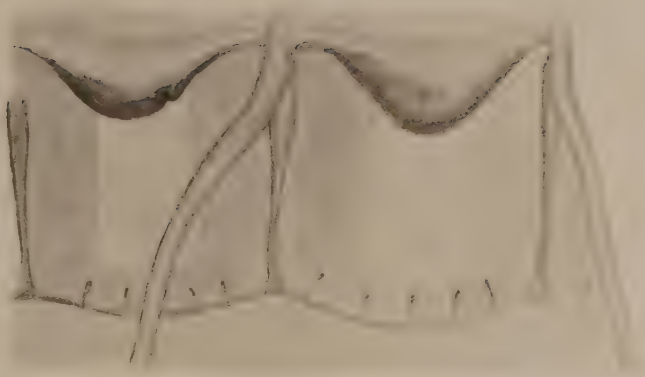

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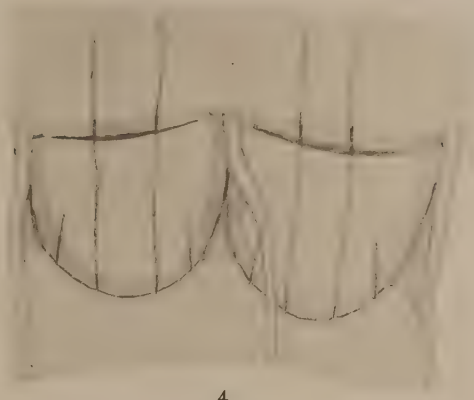

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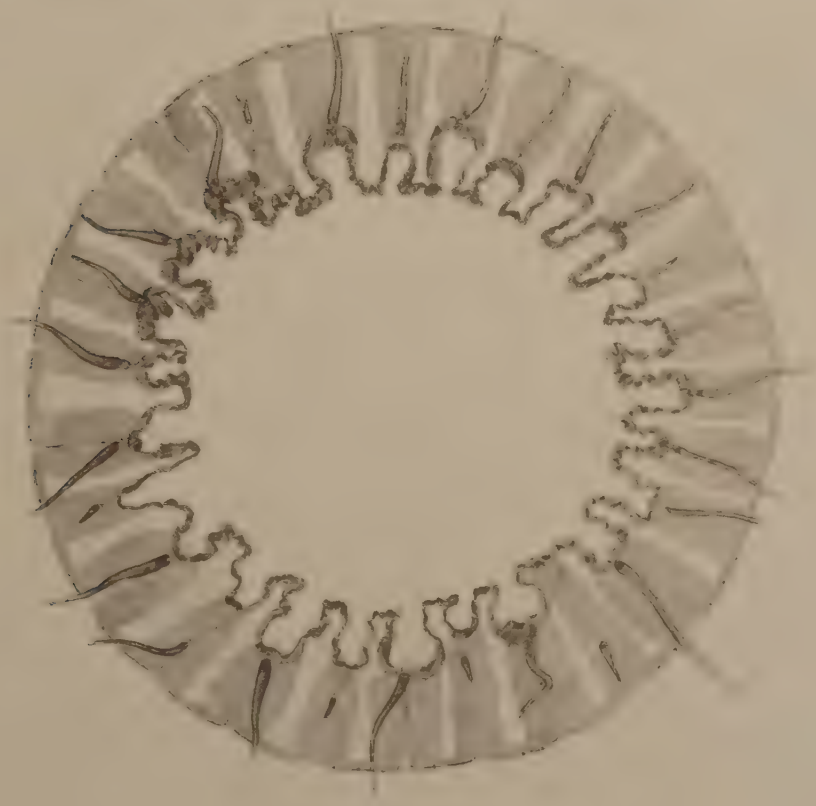

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PLATE VII

Fig. 1. *Cunina duplicata* Maas. Part of umbrella-margin of a specimen 29 mm. in diameter, showing development of gastric pouches, lappets and tentacles. St. 100. ×7.

Fig. 2. *Cunina duplicata* Maas. Statocyst with otoporpa. ×250.

Fig. 3. Two clusters of larvae of ?*Pegantha triloba* Haeckel attached to the subumbrella of *Bougainvillia platygaster* (Haeckel). St. 680. ×25.

Fig. 4. Larva of ?*Pegantha triloba* shortly before liberation, aboral view, showing radiating edges and otoporpae; from *Bougainvillia platygaster*. St. 683.

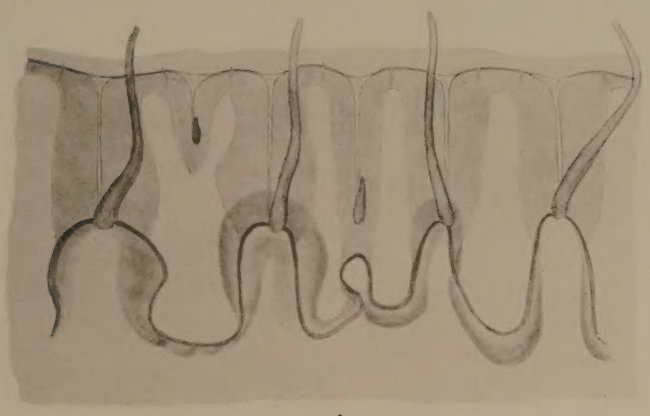
Figs. 5–7. Clusters of larvae, probably of *Cunina peregrina* Bigelow, from *Rhopalonema velatum* Gegenbaur. ×35. Fig. 5, St. 250; fig. 6, St. 254; fig. 7, St. 679.

Fig. 8. Larva of Narcomedusae in advanced stage of development, from *Rhopalonema funerarium* Vanhöffen. St. 2059. ×25.

Fig. 9. Part of umbrella margin of the same, showing a peronium and four marginal clubs with otoporpae. ×350.

Fig. 10. Cluster of larvae of Narcomedusae, from *Pantachogon haeckeli* Maas. St. 85. ×25.

Fig. 11. Newly liberated medusa of the same. ×25.



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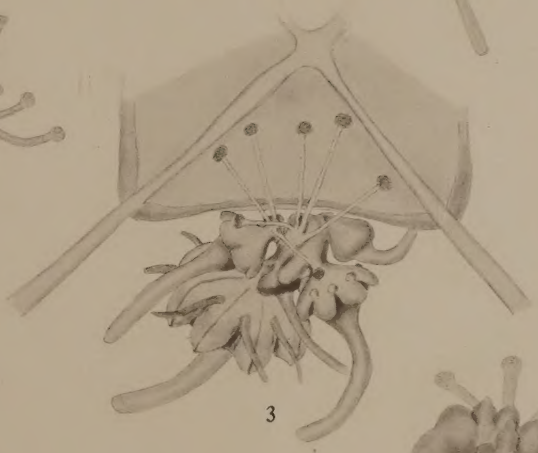

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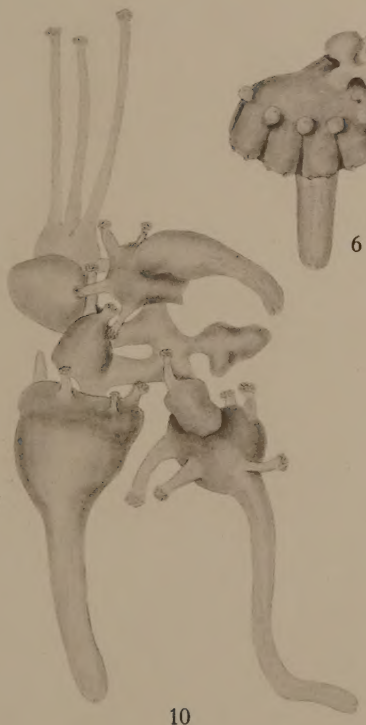

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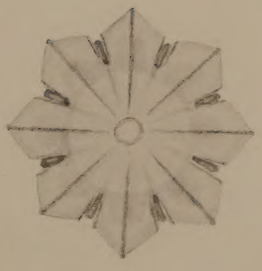

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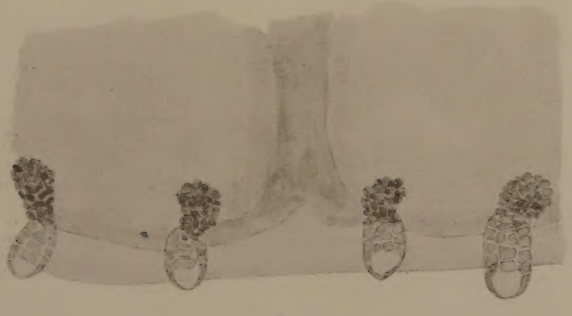

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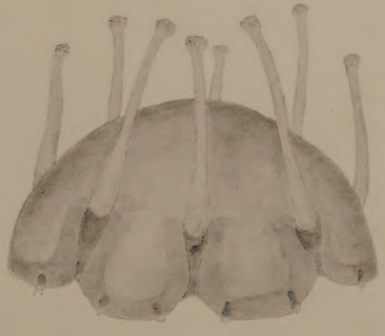

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